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Baby's Birth Plan

A Review of the Research on Pregnancy and Birth

by

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Nothing in this presentation should be construed as medical advice. This document is educational in nature, prepared by a childbirth educator who is not a medical provider. It is strictly intended to provide a general overview of the literature; the topics may not apply to you as an individual. It is not intended to be, nor should it be used as, a substitute for prenatal care and advice from a medical provider (e.g., midwife, nurse, nurse practitioner, doctor, etc.). Prenatal care is important; please see your medical provider for consultations, care, and advice. The author assumes no responsibility for your actions or decisions based upon your reading of this presentation.

Medical Model versus Physiological Model of Birthing

Medical Model

- Pregnancy is a pathology
- Potentially invasive interventions, including unnecessary routine interventions in low-risk situations

Physiological Model

- Trust in nature's way of birthing
- Hands-off, with loving support for mom-baby-partner

Which is best supported by evidence-based research?

Evidence-Based Medicine (EBM) is...

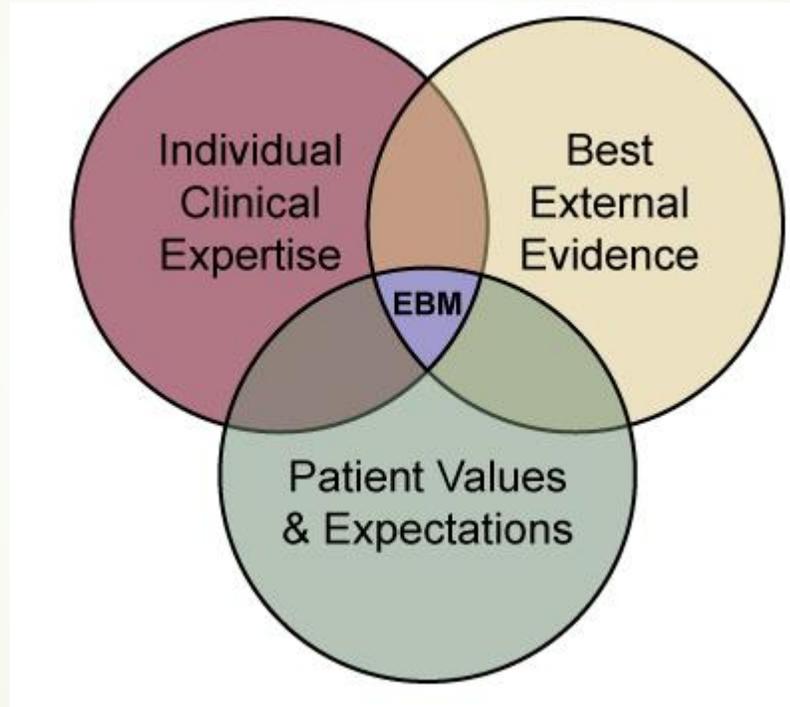


Photo Credit: community.cochrane.org

ACOG's Guidelines



- Even the guidelines produced by the American College of Obstetricians and Gynecologists (ACOG) are not evidence-based
- “One third of the recommendations put forth by the College in its practice bulletins are based on good and consistent scientific evidence”
- Another 1/3 are based on limited or inconsistent evidence
- The final 1/3 are based on consensus and opinion, which is subject to bias (Wright et al. 2011)
- “When compared to the guidelines from the Royal College of Obstetricians and Gynaecologists, 28% of obstetric recommendations were the same, 56% were not comparable, and 16% were **opposite!**” (Romm 2011)

How Can We Make Evidence-Based Care Standard Practice?

- Change has to come from the pregnant couples requesting evidence-based care and questioning current practices, when appropriate
- Our job is to help educate them on where the evidence can be found and how to access it
- Notice that I did not say that we should tell them what to do, based upon what the evidence demonstrates; they must decide this in consultation with their care providers



Photo Credit: www.doulaville.com

Methods

- ▶ Cochrane Collaboration reviews and meta-analyses
 - www.summaries.Cochrane.org
- ▶ Articles from PubMed or PubMed Central, National Center for Biotechnology Information, US National Library of Medicine
 - <http://www.ncbi.nlm.nih.gov/pubmed> (usually just summaries)
 - <http://www.ncbi.nlm.nih.gov/pmc/> (entire articles for free)
- ▶ Articles from Google Scholar
 - <https://scholar.google.com/>

Structure

- ▶ From the perspective of the baby: if I were the baby, what type of care does the evidence say I should want for my mom and myself throughout pregnancy, labor, and birth?
- ▶ Following the chronological progression of medical care from (before) conception through the first days of the baby's life
- ▶ At the end of each section, there are slides labeled "The Research Shows..." These slides are based upon the evidence shown in the research
- ▶ Each section is summed up with a slide labeled "As the Baby, I Want..." These slides are based upon the author's opinion, based upon a review of the research literature
- ▶ Be sure to read the "Notes" sections throughout—lots more information there!



First, I want my
mom to make
sure she is healthy
prior to
conceiving me

The Microbiome

- ▶ Our microbiome consists of all of the organisms that live within and on us (e.g., bacteria, fungi, viruses, protozoa)
 - ▶ 1,000 species in our intestines
 - ▶ 700 species in our mouth
 - ▶ 300-400 species in our vagina
 - ▶ 700 species on our skin
- ▶ We need diversity in our microbes in order to fight pathogens and stave off disease—they are integral to our immune and metabolic health—but we have collectively lost about 1/3 of our microbes due in large part to:
 - ▶ Antibiotics and antimicrobial products (kill off the good bacteria as well as the pathogens)
 - ▶ Lifestyle/diet (Blaser, as quoted in Harman T, Wakeford A 2014)
- ▶ The National Institutes of Health (NIH) launched the Human Microbiome Project in 2007 to study how our microbiomes may lead to various non-communicable diseases (NCDs)

(All information from Harman T, Wakeford A 2014)

The Microbiome

The health of the microbiome has been associated with several non-communicable diseases:

- ▶ Allergies
- ▶ Asthma
- ▶ Celiac disease and Irritable bowel syndrome (IBS)
- ▶ Diabetes
- ▶ Eczema
- ▶ Mental health issues, such as Autism Spectrum Disorder
- ▶ Necrotic enterocolitis (NEC) in newborns
- ▶ Obesity (Harman T, Wakeford A 2014)

The Microbiome



Photo Credit: http://www.babyknowledge.co.uk/wp-content/uploads/2013/08/bk-laughing-baby_postcard.jpg

We lay the groundwork for the life-long health of our children through the way in which we prepare our bodies for conception, care for our bodies during pregnancy, and birth our babies

The Healthy Microbiome Model



The Microbiome

For a detailed presentation on the microbiome and its importance to the development of long-term health, please see:

Nicholson L. *Seeding Lifelong Health: The Impact of Pregnancy, Birth, and Infant Care on the Baby's Developing Microbiome*. 2015.

Further information can be found at:

- ▶ American Microbiome Institute: <http://www.microbiomeinstitute.org/?gclid=CJDxpefzksgCFdYUHwodF3wDRQ>
- ▶ Gut Microbiota Worldwatch (the European Society of Neurogastroenterology and Motility): <http://www.gutmicrobiotawatch.org/en/home/>
- ▶ *Microbiome*, the journal: <http://www.microbiomejournal.com/>
- ▶ NIH Human Microbiome Project: <http://hmpdacc.org/>

The Research Shows...



- ▶ The fetal immune system depends on adequate maternal nutrition; the mother's intake of the micronutrients folate, iodine, and Vitamin D, and the fatty acid DHA, is especially important
- ▶ An unbalanced microbiome has been associated with several health challenges including: asthma, eczema, diabetes, and obesity (Munyaka PM, Khafipour E, Ghia J-E 2014)
- ▶ The greatest challenges to the healthy development of the baby's microbiome are: Cesarean delivery; antibiotic exposure before, during, or after birth; and formula feeding (Mueller et al. 2015)
- ▶ The most important steps that can be taken to ensure the proper "seeding" of the baby are:
 - ▶ Step 1: Vaginal birth
 - ▶ Step 2: Immediate skin-to-skin contact with the mother following birth
 - ▶ Step 3: Exclusive breastfeeding (preferably for at least six months) (Harman T, Wakeford A 2014)

As the Baby, I Want...



As the baby who wants to be conceived, I want:

- ▶ My mom to be of healthy weight, with a good, healthy microbiome herself (i.e., vaginal microbiome rich in lactobacilli, which is typically found in normal, healthy pregnancies) (Mueller et al. 2015)
 - ▶ Following good nutritional guidelines
 - ▶ Fermented foods and those with live cultures are especially good for gut health
 - ▶ Following the micronutrient/fatty acid recommendations, per a discussion with her care provider
 - ▶ Exercising regularly
 - ▶ Non-smoker
 - ▶ Low stress levels

Photo Credit: Lori Nicholson. Picture of Grace Kuhlmann, my youngest daughter.

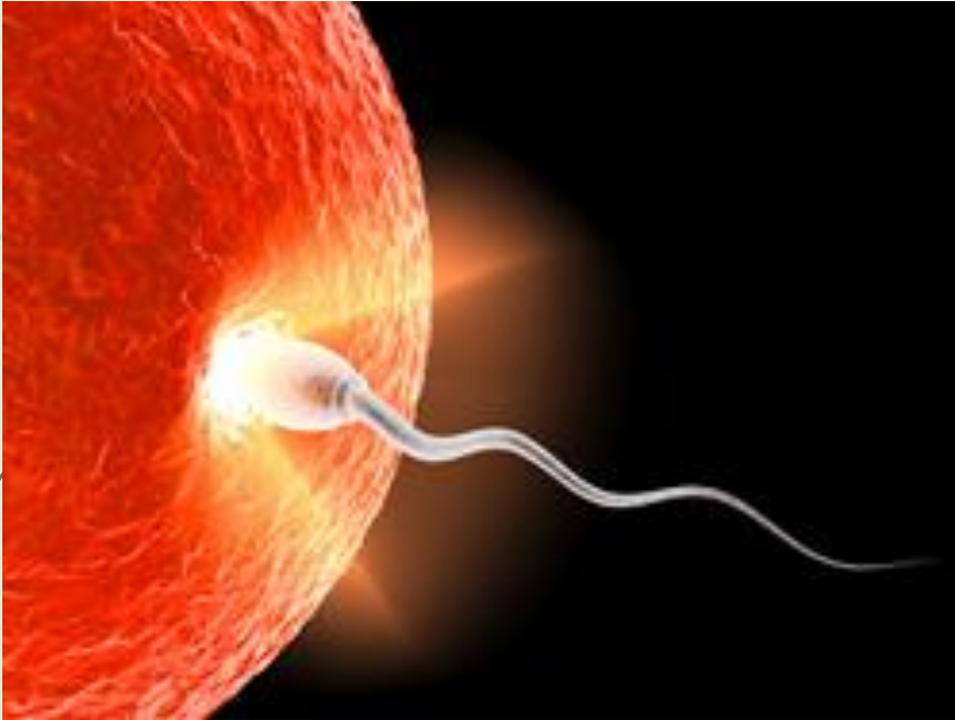


Photo Credit: www.mumsnet.com

Conception
Occurs!

Selecting a Care Provider

You are the hiring manager for **your** birth!

- ▶ If you want or need a Cesarean, you should not hire a midwife
- ▶ If you want a completely natural birth, you should not hire an OB/GYN who has a 35-40% C-section rate
- ▶ This is one of the most important decisions you will make about your birth
- ▶ Would you hire an individual who came into your office and said, “I’m really smart, I’m really well educated, I’m respected by my peers, I have enormous amounts of experience, and I don’t agree with the philosophy of your organization”? No, none of us would.

Hire a care provider whose philosophy and approach match your own

Selecting a Care Provider

“Having a highly trained obstetrical surgeon attend a normal birth is analogous to having a pediatric surgeon babysit a healthy 2-year-old.”

- Marsden Wagner, MD, former perinatologist and perinatal epidemiologist, former Regional Officer for Maternal and Child Health in the European Regional office of the World Health Organization (<http://www.allhealthreviews.com/inspirational-breastfeeding-quotes/>)

Selecting a Care Provider

In the 2013 Listening to Mothers III survey:

- ▶ 78% reported using an OB/GYN
- ▶ 9 % reported using a family physician
- ▶ 8% reported using a midwife
- ▶ 5% reported using another type of care provider (nurses who are not midwives, physician assistants, unknown type of doctor, or “not sure”)
(Declercq et al. 2013)

Midwifery Model of Care

PEARLS OF MIDWIFERY

The Midwifery Model of Care

- Recognizes the woman as a unique individual in the context of her family and community
- Supports and protects the normal physiologic process of labor and birth
- Establishes the woman as an active partner in her own care

Rooks, 1999

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“Midwives emphasize helping women make changes conducive to healthy pregnancies, infants, and families. Midwifery practice focuses on what is normal, with careful attention to recognizing and managing deviations from normal. **All health care providers involved in birth can provide care within the midwifery model.**”

Reference: Evidence-Based Practice: Pearls of Midwifery®: A Presentation by The American College of Nurse-Midwives. 2014.

Selecting a Care Provider: Midwives

“The American College of Obstetricians and Gynecologists (the College) and the American College of Nurse-Midwives (ACNM) affirm our shared goal of safe women’s health care in the United States through the promotion of evidence-based models provided by obstetrician-gynecologists (ob-gyns), certified nurse-midwives (CNMs), and certified midwives (CM). The College and ACNM believe health care is most effective when it occurs in a system that facilitates communication across care settings and among providers.”

- Joint Statement of Practice Relations between Obstetrician-Gynecologists and Certified Nurse-Midwives/Certified Midwives

Selecting a Care Provider: Doulas

- ▶ A doula is a “trained and experienced professional who provides continuous physical, emotional and informational support to the mother before, during and just after birth” (birth doula); there are also postpartum doulas (not covered here) (DONA website)
- ▶ Birth doulas “mother the mother” by:
 - ▶ Assisting the parents in preparing their birth plan
 - ▶ Staying with the mother throughout labor
 - ▶ Providing emotional support and physical comfort measures throughout labor
 - ▶ Assisting the parents in making important decisions about their care throughout labor and facilitating those discussions with their care providers
 - ▶ Providing support and breaks to the birth companion throughout labor (DONA website)



Photo Credit:

http://crowninglotus.typepad.com/crowning_lotus/2014/06/doulas-are-not-midwives-and-midwives-are-not-doulas.html

The Research Shows...



Women who received care from CNMs were more likely to experience (continued):

- ▶ Significant reduction in the incidence of third and fourth degree perineal tears (Newhouse et al. 2011)
- ▶ Fewer preterm births, and fewer babies with low birth weight or hypothermia (Renfrew et al. 2014)
- ▶ Lower rates of Cesarean birth (Newhouse et al. 2011; ACNM 2012b; Hamilton et al. 2010; Shaw-Battista et al. 2011)
- ▶ Lower infant mortality rates (ACNM 2012)
- ▶ Higher rates of breastfeeding (Newhouse et al. 2011; ACNM 2012b; Declercq et al. 2006)

The Research Shows...



- ▶ All at a lower cost (due to fewer interventions and lower C-section rates) (ACNM 2012)
- ▶ And with higher reported maternal satisfaction (Renfrew et al. 2014)
- ▶ Findings were confirmed by a 2015 Cochrane review of midwife-led care (Sandall et al. 2015)



Photo Credit: kidshealth.org

As the Baby, I Want...



- ▶ As the baby who has been conceived:
 - ▶ I want my mom to hire a midwife for prenatal, and labor and delivery care
 - ▶ I want my mom to hire a doula to work with her throughout pregnancy and to attend her during labor

Selecting a Birthing Location

- ▶ In 2009, 7.6% of all hospital costs were attributable to maternity and newborn care, totaling over \$27 Billion (US) (Correy et al. 2012, as referenced in Kozhimannil et al. 2014)
- ▶ Maternity and newborn care was the top expenditure category for payments made by both public payers and private health insurance companies to hospitals (Andrews 2008, as referenced in Kozhimannil et al. 2014)

Maternity and newborn care = BIG MONEY!



Average Total Costs of Maternity and Newborn Care

Commercial Payers

- Cesarean = \$27,866
- Vaginal = \$18,329

C-sections are 52% more expensive

Medicaid

- Cesarean = \$13,590
- Vaginal = \$9,131

Less expensive overall, but C-sections are still 49% more expensive than vaginal births

Reference: Truven Health Analytics 2013

Selecting a Birthing Location: In-Hospital Birthing Center



Photo Credit: www.ecommunity.com

- Often staffed by midwives
- May offer care throughout pregnancy and birth, or only during labor
- Feature specially designed room ("bedroom-like" with good ambience)
- When compared to standard hospital rooms, the alternative setting increased the likelihood of:
 - No intrapartum analgesia/anesthesia
 - Spontaneous vaginal birth
 - Breastfeeding at six to eight weeks
 - Positive views of care received (high maternal satisfaction) (Hodnett ED, Downe S, Walsh D 2012)

Selecting a Birthing Location: Freestanding Birth Centers

- ▶ The American Association of Birth Centers (AABC) defines a birth center as “a home-like setting where care providers, usually midwives, provide family-centered care to healthy pregnant women”
 - ▶ Subscribe to the “wellness” model of birth, using interventions only when medically necessary
 - ▶ Integrated within the health system, for safe, uninterrupted care during transfers (Dekker – AABC website)
- ▶ One study found that 80.9% of the women who gave birth in a freestanding birth center with a collaborative practice group (midwives and physicians) gave birth vaginally versus 62.8% in an all-physician group (Jackson et al. 2003)
- ▶ Since 1990, the 21 countries that were most successful in reducing maternal mortality rates (by at least 2.5% per year) also had substantial increases in births taking place in freestanding birth facilities, attended by midwives (Renfrew et al. 2014b)

Selecting a Birthing Location: Home Births



Photo Credit: Betsy King,
<http://www.babble.com/babble-voices/what-a-home-birth-looks-like/>

- ▶ In the UK: 80% of women gave birth at home in the 1920s→2.3% gave birth at home in 2011 (Office of National Statistics 2012)
- ▶ In the US: 50% of women gave birth at home in 1938→0.89% gave birth at home in 2012 (up from 0.56% in 2004) (MacDorman M, Mathews TJ, and Declercq E 2014)
- ▶ Rates of planned home births range from 0.1% in Sweden to 20% in the Netherlands (Zielinski R, Ackerson K, Kane Low L 2015; de Jonge et al. 2014)
- ▶ Small, but significant, increases are being seen in home birth, especially in developed countries (Zielinski R, Ackerson K, Kane Low L 2015)

Selecting a Birthing Location: Home Births

- ▶ 2014 landmark study of 16,924 women who planned a home birth with a midwife, using Midwives Alliance of North American Statistics Project (MANA Stats) 2.0 data —the largest analysis of home birth in the US ever published
- ▶ Maternal Outcomes:
 - ▶ 89.1% gave birth at home (majority of intrapartum transfers were for failure to progress)
 - ▶ 4.5% required oxytocin (versus national rates of 24% for labor induction and 16% for augmentation in term pregnancies)
 - ▶ 4% used epidural analgesia (versus 67% national rate)
 - ▶ 1.4% rate of episiotomy (versus 25% national average) (Cheyney et al. 2014)



Selecting a Birthing Location: Home Births

- ▶ Maternal Outcomes (continued):
 - ▶ 93.6% spontaneous vaginal birth
 - ▶ 1.2% assisted vaginal birth (e.g., forceps, vacuum) (versus 3.5% national average)
 - ▶ 5.2% Cesarean birth (versus 31% national average)
 - ▶ Of the 1,054 women attempting a VBAC, 87% were successful
 - ▶ Low rate of postpartum maternal transfer (1.5%) (Cheyney et al. 2014)



Selecting a Birthing Location: Home Births

- ▶ Infant Outcomes:
 - ▶ Among these women who planned a home birth with a midwife, the babies were at very low risk for:
 - ▶ Being born prematurely (2.5%)
 - ▶ Being born too small (<1%): the babies weighed an average of eight pounds at birth
 - ▶ Having a low 5-minute Apgar score (1.5%)
 - ▶ Requiring a transfer to a hospital after being born at home (1%)
 - ▶ 98% of the infants were being breastfed, and the majority (86%) were being exclusively breastfed, at 6 weeks of age
 - ▶ Excluding lethal anomalies, intrapartum (1.30/1,000), early neonatal (0.41/1,000), and late neonatal (0.35/1,000) mortality rates were similar to the rates found in other studies and in national data (Cheyney et al. 2014)



Selecting a Birthing Location: Remember the Microbiome!



Photo Credit: www.drperlmutter.com

- ▶ When the baby is born, s/he is “seeded” with mom’s microbes **and** the microbes in her/his environment
- ▶ As discussed, the foundation for baby’s long-term health is laid at this time
- ▶ We have no research to inform what impact different birthing environments may have on the baby’s microbiome; however:
 - ▶ Being in one’s home environment may support this “seeding” process—exposing baby only to his/her own family’s microbes
 - ▶ Babies born in a hospital or birthing center may benefit from being exposed only to those items that have been brought from home (e.g., blankets, clothing) immediately following birth

The Research Shows...



- ▶ Maternity care = big bucks for hospitals (Andrews 2008, as referenced in Kozhimannil et al. 2014)
- ▶ C-sections are approximately 50% more expensive than vaginal births (Truven Health Analytics 2013)
- ▶ The move from home to hospital birth has led to:
 - ▶ Greater use of technology
 - ▶ Loss of autonomy for midwives (Declercq et al. 2001)
- ▶ Health systems where midwives do not practice have:
 - ▶ Higher rates of interventions
 - ▶ Inequalities in care provision and outcomes
 - ▶ Higher elective Cesarean rates (Renfrew et al. 2014; Gibbons et al. 2010)
- ▶ Strong evidence shows that hospital policies for laboring women (e.g., electronic fetal monitoring, IV fluids, no food or drink, restriction to bed, artificial induction): do no good, and may cause harm (Dekker – AABC website)

The Research Shows...



- ▶ **Home birth:** However, in the 2014 home birth study:
 - ▶ More first-time moms had to transfer
 - ▶ More postpartum hemorrhages were experienced than in national studies (although only 1% had to transfer as a result of this)
 - ▶ Breech babies were at 12 times higher risk of death during labor than babies born in a vertex position (Cheyney et al. 2014)
- ▶ Research shows that planned home birth is a safe option for low-risk women, especially for those who have given birth vaginally previously (Cheyney et al. 2014)
- ▶ Planned home birth is best supported by an environment where:
 - ▶ Good risk selection criteria are in place
 - ▶ There is an adequate transportation infrastructure for transfers
 - ▶ A good referral system is in place (Brocklehurst et al. 2011; De Jonge et al. 2014; Hutton EK, Reitsma AH, Kaufman K 2009)

As the Baby, I Want...



As the baby in my mom's womb, I would like her to:

- Seek midwifery-led care, whether in a hospital-based birthing center or elsewhere
- Consider a birthing center birth or a planned home birth, following a discussion of the risks with her care provider



Photo Credit: www.hngn.com

Getting bigger...

Estimated Due Date (aka “A Set-Up for Anxiety”)



Photo Credit:
www.roanokechowan.edu

- Due dates are typically calculated as 280 days (40 weeks, or 10 lunar months) from the first day of the last menstrual period (LMP); alternatively, add seven days to the first day of the LMP and count forward nine months (or back three months and add one year) (WebMD 2015; Baskett TF, Nagele F 2000; Grzybowski S, Nout R, Kirkham CM 1999)
- This calculation is known as Naegele’s rule, which assumes a “typical” 28-day cycle
- None of the professors who originally wrote in the 18th and 19th centuries about how to calculate due dates ever specified whether the counting should begin with the **first** day of the woman’s LMP, or the **last** day of the woman’s LMP (Baskett TF, Nagele F 2000)

Estimated Due Date

- ▶ Only 3.6% of deliveries take place on the estimated due date (EDD) when relying on LMP dating; early ultrasound increases that slightly to 4.3-5% of births occurring on the EDD (Grzybowski S, Nout R, Kirkham CM 1999; Mongelli M, Wilcox M, Gardosi J 1996; Khambalia et al. 2013)
- ▶ Two-thirds of births occur within seven days of the EDD, with no meaningful differences in the estimated dates based upon the timing of the ultrasound scans (Khambalia et al. 2013)
- ▶ Several researchers have found that ultrasound estimation of gestational age predicts the expected date of delivery to be three days later than relying on Naegele's rule would suggest (Olsen 1999; Backe B, Nakling J 1994)
- ▶ Ultrasound is most accurate during weeks 11-14, with accuracy declining sharply after 20 weeks (Khambalia et al. 2013)
- ▶ ACOG states that "high-quality ultrasound measurement of the embryo or fetus in the first trimester is the most accurate method to establish or confirm gestational age" and "subsequent changes to the EDD should be reserved for rare circumstances" (ACOG 2014a; ACOG 2014b)

The Research Shows...



- Estimated due dates (EDDs) are not particularly accurate
- Third-trimester ultrasounds are not as accurate as earlier ultrasounds or the LMP in determining due date (Dekker 2015)
- Various alternative dating systems have been suggested:
 - Adding 10 days to the first day of the LMP to better fit the data from ultrasound dating, basal body temperature dating, and the modal duration of pregnancy from a retrospective, population-based study in Sweden (Baskett TF, Nagele F 2000)
 - Offering women a range of time during which they are likely to give birth; about 50% of first-time moms will give birth by 40 weeks, 5 days (for experienced moms, 50% will have given birth by 40 weeks, 3 days) (Dekker 2015)
 - A group of Canadian researchers have introduced a new “Maternity Care Calendar Wheel” which is designed to reflect “the biological realities of pregnancy,” and which includes prompts for prenatal education and antenatal care (Grzybowski S, Nout R, Kirkham CM 1999)
 - “Much anxiety would be alleviated if a range of dates (38-42 weeks) was substituted for a specific date of delivery” (Saunders N, Paterson C 1991)

As the Baby, I Want...



- ▶ For my mom to be provided with a range of dates during which she is likely to give birth, to be based upon:
 - ▶ My mom's LMP
 - ▶ Possibly one early ultrasound completed between 11-14 weeks of gestation
- ▶ For me and my mom to be treated with patience and expectant management, in the absence of any special circumstances

Exercise During Pregnancy



Photo Credit:
www.fithealthymoms.com

- ▶ Excessive weight gain during pregnancy has been associated with gestational diabetes, pregnancy-related hypertension, macrosomia, and an increased risk of Cesarean section and stillbirth (Streuling et al. 2010; Muktabhant et al. 2014)
- ▶ Excessive weight gain has also been associated with greater maternal postpartum weight retention and higher childhood body mass index (BMI) in offspring (Streuling et al. 2010)
- ▶ Guidelines for engaging in physical activity while pregnant generally support “moderate intensity physical activity” throughout pregnancy, with cautions against participating in sports with risks of collisions, trauma, or falls (Evenson et al. 2014)

Exercise During Pregnancy

- ▶ A 2006 Cochrane review of 14 trials involving 1,104 low-risk pregnant women found that regular aerobic exercise helped them improve (or maintain) physical fitness (Kramer MS, McDonald SW 2006)
- ▶ A 2011 meta-analysis of 12 randomized, controlled trials of 1,073 low-risk pregnant women found significantly lower average gestational weight gains in the intervention group (those engaging in physical activity) versus the control group (Streuling et al. 2010)
- ▶ A 2014 Cochrane meta-analysis of 49 randomized controlled trials (including 11,444 women) reported that interventions involving: low glycemic foods/diets, supervised or unsupervised exercise only, or diet and exercise combined all led to similar reductions in the number of women who gained excess weight during pregnancy—each reducing the risk of excessive weight gain during pregnancy on average by 20% overall; maternal hypertension was also reduced in the intervention group (Muktabhant et al. 2014)



Photo Credit:
www.youmefit.com

Exercise During Pregnancy

- ▶ Providing individualized nutrition and exercise programs to overweight and obese pregnant women reduced the risk of excessive pregnancy weight gain (80% of the women did not exceed recommended pregnancy weight gain) and minimized weight retention at two months postpartum (Mottola et al. 2010)
- ▶ A review of the literature on physical activity during pregnancy found “sufficient empirical evidence to support the promotion of moderate to vigorous prenatal physical activity for maternal health benefits” (Symons Downs et al. 2012)
- ▶ A Canadian study found that even small amounts of maternal physical activity—20 minutes of moderate exercise three times per week during pregnancy—“enhances the newborn child’s brain development” (Université de Montréal 2013)
- ▶ A secondary analysis found that obese pregnant women were more likely to exercise if they had: a history of miscarriage; children living at home; lower pre-pregnancy weight; no nausea and vomiting; and no lower back pain during pregnancy (Foxcroft et al. 2011)



Photo Credit:
www.babble.com

Exercise During Pregnancy and Gestational Diabetes

- ▶ A 2011 meta-analysis of eight studies, including 35,000 women, found that engaging in physical activity both prior to conception and throughout pregnancy help decrease the risk of developing gestational diabetes significantly:
 - ▶ Higher levels of **pre-pregnancy** physical activity led to a 55% reduction in the risk of developing gestational diabetes
 - ▶ Physical activity undertaken in early pregnancy led to a 25% lower risk (Tobias et al. 2011)
- ▶ Exercise guidelines for women with gestational diabetes mellitus include moderate aerobic and resistance training exercises, three times per week, for 30-60 minutes per exercise session (Padayachee C, Coombes JS 2015)



Photo Credit:
www.healthisright.com

As the Baby, I Want...



- ▶ My mom to engage in regular, moderate intensity exercise both before her pregnancy and during her pregnancy—for her health and mine

Prenatal Ultrasound

- ▶ First and second trimester organ scans; biophysical profile (BPP); amniotic fluid index (AFI); placental grading 0-III; and Doppler umbilical, uterine and fetal artery velocity testing have been tested in randomized controlled studies on tens of thousands of women
- ▶ Tests are used to attempt to identify fetal growth restriction (FGR or IUGR), suspected placental insufficiency, and suspected postdate pregnancy (Cohain 2012)
- ▶ In the Listening to Mothers III report, 98% of mothers indicated they had had at least one ultrasound during their pregnancy, with a majority (70%) having three or more, and 23% having six or more (Declercq et al. 2013)



Photo Credit:
wisdomandbirth.blogspot.com

Prenatal Ultrasound: Safety

- ▶ One review of the literature states that intensity limits increased dramatically (more than 15 times!) from 46 mW/cm² in 1985 to a possible 720 mW/cm² in 1992, without “a comprehensive research program to evaluate possible risks in diagnostic ultrasound” (Miller 2008)
- ▶ Any safety assurance has to rely on: “1) an assumption of safety for pre-1976 ultrasound devices; 2) theoretical consideration of important bioeffects mechanisms; and 3) interpretation of published research studies which may or may not have any relation to obstetrical ultrasound” (Miller 2008)



Photo Credit: ari-cn.com

Prenatal Ultrasound: Efficacy

- ▶ A 2008 Cochrane review found that “available evidence from randomised (sic) controlled trials does not support the use of BPP as a test of fetal wellbeing in high-risk pregnancies” (Lalor et al. 2008)
- ▶ A 2010 Cochrane review found no benefits to the use of utero-placental Doppler ultrasound in the second trimester of pregnancy among women at low risk for hypertensive disorders (Stampalija T, Gyte GML, Alfireciv Z 2010)
- ▶ Based on the results of two Cochrane reviews, their own meta-analysis, and other randomized controlled trials, researchers concluded that “there is no evidence that routine ultrasonography has any impact on perinatal mortality compared to the selective use of ultrasonography based upon the clinician’s judgment” (Haws et al. 2009)
- ▶ A 2015 Cochrane review found no conclusive evidence that the use of routine umbilical artery Doppler ultrasound, or a combination of umbilical and uterine artery Doppler ultrasound, in low-risk or unselected populations benefited either mother or baby (Alfirevic Z, Stampalija T, Medley N 2015)
- ▶ Another 2015 Cochrane review found that routine late pregnancy ultrasound in low-risk or unselected women (versus no routine ultrasound testing) led to no difference in the primary outcomes of perinatal mortality, preterm birth less than 37 weeks, Cesarean rates, or induction of labor rates (Bricker L, Medley N, Pratt JJ 2015)

Prenatal Ultrasound: Efficacy

- ▶ A very recent 2015 Cochrane review found that early ultrasound (i.e., less than 24 weeks of gestation) “improves the early detection of multiple pregnancies” and improves gestational dating, which may result in fewer inductions for post maturity (Whitworth M, Bricker L, Mullan C 2015)
 - ▶ No evidence of a significant difference between the screened and control groups for perinatal death
 - ▶ Routine scans were not shown to reduce adverse outcomes for babies or lead to less health service use by mothers and babies (Whitworth M, Bricker L, Mullan C 2015)

Prenatal Ultrasound: Accuracy

- ▶ Concerns with the accuracy of ultrasound:
 - ▶ A 2006 study on the use of ultrasound for prenatal diagnosis of surgical anomalies found overall false positive rates of 12% in 2000, 11% in 2001, and 9% in 2002 (Borsellino et al. 2006)
 - ▶ One study found that 34% of ultrasound fetal weight estimates were outside the expected -10%-+10% range (Hargreaves 2011)
 - ▶ 4% of first trimester ultrasounds where the woman was told there was no viable pregnancy were wrong (false negatives) (Abdallah et al. 2011)
 - ▶ Ultrasound could not reliably identify a nuchal cord, or determine whether the cord was tight (Cohain 2010)
 - ▶ 3D Doppler ultrasounds used to detect the cord in labor were only able to detect 35% of cords around the neck, 60% of cords that were wrapped twice around the neck, and had a 20% false positive rate (Bolten et al. 2009)
 - ▶ ACOG states that the ability of ultrasound to find gross anomalies varies from 13%-85% (ACOG 2009, as referenced in Cohain 2012)

Prenatal Ultrasound: Timing

- ▶ Finnish researchers found that ultrasound at any time between 8-16 weeks was more accurate than the LMP at dating the pregnancy → number of post-term pregnancies declined from 10.3% to 2.7% (Taipale P, Hiilesmaa V 2001)
- ▶ The most accurate time to perform an ultrasound to determine gestational age is 11-14 weeks (more accurate than LMP dating, or ultrasound done at any other time); ultrasound accuracy declines sharply after 20 weeks (Khambalia et al. 2013)

The Research Shows...



- ▶ Early ultrasound improves the detection of multiples and gestational dating, which may impact interventions that women are offered (Whitworth M, Bricker L, Mullan C 2015)
- ▶ Other studies, literature reviews, and a meta-analysis found that “no routine ultrasound screening protocol improves outcomes” (Lalor et al. 2008; Stampalija T, Gyte GML, Alfireciv Z 2010; Haws et al. 2009; Alfirevic Z, Stampalija T, Medley N 2015; Bricker L, Medley N, Pratt JJ 2015)
- ▶ Dramatic increases in intensity limits and peak exposures for ultrasound have been implemented without a coordinated effort to study the safety of these new, higher limits (let alone the initial limits, which were “assumed safe”) (Miller 2008)
- ▶ The lack of accuracy of ultrasound is very concerning (Borsellino et al. 2006; Hargreaves 2011; Abdallah et al. 2011; Cohain 2010; Bolten et al. 2009)
- ▶ *If* an ultrasound is going to be performed for gestational dating purposes, it should take place between 11-14 weeks of gestation (TaipaleP, Hiilesmaa V 2001; Khambalia et al. 2013)

As the Baby, I Want...



As the baby gestating in my mother's womb I:

- ▶ May want my mom to have one “early ultrasound” (prior to 20 weeks, and preferably between 11-14 weeks) for gestational dating and to detect whether she is carrying a twin
- ▶ Would want her to decline late second trimester and all third trimester ultrasounds—including for amniotic fluid index testing or for conducting a BPP—unless there was a reason for concern that she discussed thoroughly with her care provider
- ▶ Would like to see a coordinated effort undertaken to study the safety of ultrasound (rather than just having it presumed to be safe)



Photo Credit: s3-us-west-1.amazonaws.com

The Time is Drawing
Near!

Prenatal Perineal Massage



Photo Credit:
www.pinterest.com

- ▶ Spontaneous tearing rates range from 44-79%, based upon studies where episiotomies were restricted (Soong B, Barnes M 2005; Dahlen et al. 2007)
- ▶ Tears are more likely during first vaginal births and those births where forceps or vacuum assistance are used (Aasheim et al. 2011)
- ▶ A 2013 Cochrane review found that perineal massage—undertaken by the woman or her partner “**for as little as once or twice a week from 35 weeks**”—was able to: reduce the likelihood of perineal trauma requiring suturing and the risk of episiotomy for first-time moms; and reduce the risk of pain at three months postpartum for moms who had previously birthed vaginally (Beckmann MM, Stock OM 2013)

Perinatal Perineal Massage

- ▶ A 2011 Cochrane review reported that warm compresses on the perineum during labor were found to reduce third- and fourth-degree tears to a significant degree, and were found to be acceptable to the women and their care providers (Aasheim et al. 2011)
 - ▶ Perineal massage versus hands-off was found to reduce third- and fourth-degree tears (Aasheim et al. 2011)
 - ▶ Hands-off had a significant effect on reducing the rate of episiotomy (Aasheim et al. 2011)

As the Baby, I Want...



- ▶ My mom to practice perineal massage on herself, or with the help of her partner, a few times per week, from 35 weeks onward
- ▶ My mom to feel free to use a warm compress on her perineum during labor to ease me out into the world

Happy Birthing
Day!



Photo Credit: countrylifemidwifery.com

Saline Lock (or Hep-Lock)

- ▶ Many hospitals have policies that “require” laboring women to have a saline lock or hep-lock—“just in case” ...
 - ▶ ...the woman requires an emergency C-section (all women tend to be treated as “potential C-sections” for liability reasons)
 - ▶ ...the woman experiences post-partum hemorrhage
 - ▶ ...the woman experiences retained placenta
- ▶ Saline locks are routinely inserted if: the woman needs antibiotics due to testing GBS positive; the woman is experiencing discomfort or nausea; or the woman is being induced



Photo Credit:
community.babycenter.com

Saline Lock

- ▶ Despite the widespread—almost universal—use of saline locks during labor, I could find no research studies of any design on this topic
 - ▶ While we have no data on saline locks doing any harm, we also have no research on saline locks being necessary during labor
 - ▶ Are saline locks being inserted merely for the convenience of the hospital staff—“just in case”?
- ▶ One analysis has been produced by Evidence Based Birth, which concluded that “there is little-to-no evidence for the use of a saline lock during an un-medicated labor” (Dekker 2012)

The Research Shows...

- There are no research studies on this topic



As the Baby, I Want...



- ▶ Assuming my mom is low-risk, I would like her to politely decline the saline lock, so that she can focus more on her deep relaxation for an easier, gentler birth

Fetal Monitoring



Photo Credit:
motheroffact.wordpress.com

- ▶ During labor, baby's heart rate can be monitored either intermittently (e.g., at regular intervals throughout labor) or continuously (which may restrict the mother's movements)
- ▶ Various methods can be used to monitor baby's heart rate:
 - ▶ Using a fetal stethoscope while palpating the mother's uterine contractions (known as intermittent auscultation)
 - ▶ Using a handheld Doppler ultrasound device while palpating the mother's uterine contractions (also referred to as intermittent auscultation)
 - ▶ Using a cardiotocograph (CTG) to electronically record baby's heart rate and the mother's uterine contractions on a paper trace—known as external CTG (can be used either continuously or intermittently)
 - ▶ Using a CTG and scalp electrode, attached to baby's head, to monitor baby's heart rate—known as internal CTG (used continuously) (Alfirevic Z, Devane D, Gyte GML 2013)

Fetal Monitoring

- ▶ During continuous fetal monitoring, the ultrasound sensor to monitor baby's heart rate and the pressure sensor to monitor the mother's uterine contractions are never removed (except for brief bathroom breaks)
- ▶ Intermittent CTG is rarely used, but would require at least 20 minutes of monitoring per hour
- ▶ Using intermittent auscultation (IA), a care provider listens to the baby's heart rate for 60 seconds using a fetal stethoscope (fetoscope) or a hand-held Doppler:
 - ▶ Every 15 minutes during the first stage of labor (during thinning and opening)
 - ▶ Every 5 minutes during the second stage of labor (while nudging, pushing, or breathing your baby down) (Alfirevic Z, Devane D, Gyte GML 2013)



Photo Credits:
www.pregnancy.com.au and
www.promisebirth.com

Fetal Monitoring

- ▶ In the 2007 Listening to Mothers II study, **87% of US mothers described receiving continuous fetal monitoring, while only 4% received intermittent EFM** during labor (Declercq et al. 2007)
- ▶ Three major literature reviews have found that continuous CTG leads to a decrease in the rate of neonatal seizures, but an increase in the rate of C-sections and operative vaginal deliveries (Alfirevic A, Devane D, Gyte GML 2013; Thacker SB, Stroup DF, Peterson HB 1995; Thacker SB, Stroup D, Chang M 2001)
- ▶ It is estimated that **EFM leads to one additional C-section for every 58 women monitored, and one additional C-section for every 12 high-risk women** in labor (Alfirevic Z, Devane D, Gyte GML 2013)
- ▶ “Intermittent use of electronic fetal monitoring at regular intervals (with stethoscopic auscultation in between) appears to be as safe as continuous electronic fetal monitoring in low risk labours” (sic) (Herbst A, Ingamarsson I 1994)

Fetal Monitoring upon Admission

- ▶ A 2012 Cochrane review compiled results from four randomized, controlled trials with more than 13,000 women and found:
 - ▶ There was no evidence of benefit for the use of the 20-minute fetal monitoring CTG upon admission for low-risk women
 - ▶ Admission CTG increases the C-section rate by approximately 20%
 - ▶ Women who were allocated to the “EFM upon admission” group were more likely to experience continuous EFM throughout labor (Devane et al. 2012)

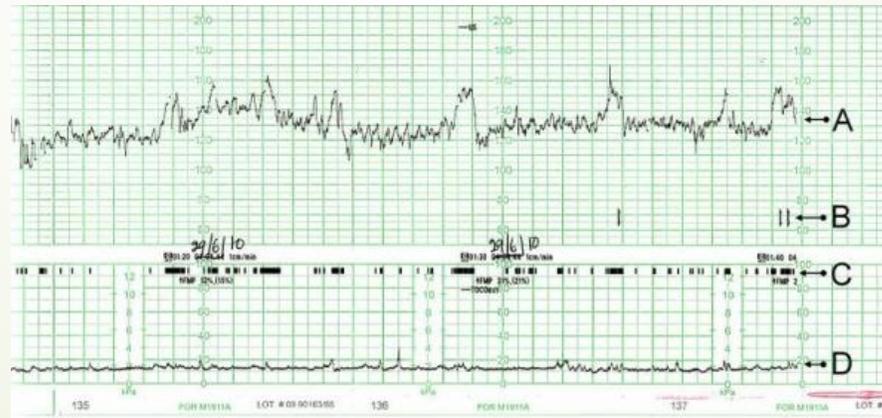


Photo Credit: mylocalhealthguide.com

Fetal Monitoring Efficacy and Safety

- ▶ A 2008 National Institute of Child Health and Human Development Workshop Report on EFM reported that “with the high penetrance of this technology into obstetric practice, well-designed studies are needed to fill gaps in knowledge” (Macones et al. 2008)
- ▶ An updated technology assessment of EFM/CTG stated that “our findings of insufficient evidence of efficacy and concerns about safety have been confirmed by subsequent research” (Banta HD, Thacker SB 2002)
- ▶ Might hospital policies that support continuous EFM be based upon liability fears, as opposed to clinical research?

The Research Shows...



- ▶ Compared to intermittent auscultation, continuous EFM helps to decrease the risk of newborn seizures (a rare outcome); however, continuous EFM increases the risk of C-section and the risk of forceps/vacuum delivery (Alfirevic A, Devane D, Gyte GML 2013; Thacker SB, Stroup DF, Peterson HB 1995; Thacker SB, Stroup D, Chang M 2001)
- ▶ Continuous EFM may restrict the movements of the mother throughout labor
- ▶ EFM upon admission leads to more continuous fetal monitoring throughout labor and higher rates of C-section (Devane et al. 2012)
- ▶ The efficacy and safety of continuous EFM have been called into question (Banta HD, Thacker SB 2002)

As the Baby, I Want...



- My mom to have intermittent auscultation during labor

Length of Labor

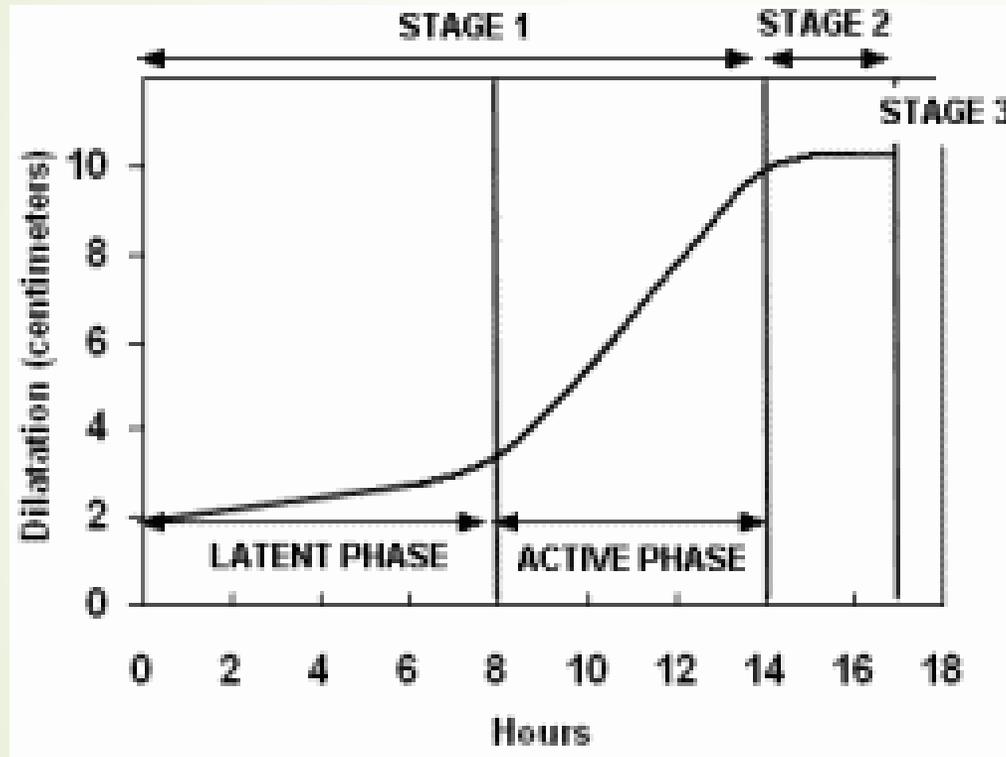
- ▶ The “typical” labor curve impacts care providers’ expectations about the progression of labor
- ▶ If the care provider is concerned about how labor is progressing, s/he may declare “failure to progress” and offer or recommend additional interventions such as:
 - ▶ Amniotomy (artificial rupture of the membranes)
 - ▶ Oxytocin (Pitocin) augmentation
 - ▶ Cesarean delivery for “failure to progress”
- ▶ Once a laboring woman enters the hospital, she is put “on the clock”
 - ▶ Women tend to dislike being turned away from the labor ward before admission for delivery (Scotland et al. 2011); yet...
 - ▶ Low-risk nulliparous women who are admitted in pre-active labor are more likely to experience oxytocin augmentation, and are more likely to have a Cesarean delivery, than low-risk, nulliparous women admitted in active labor (Neal et al. 2014)

MY BODY WILL GIVE
BIRTH IN ITS OWN
TIME

I will give birth my way

Photo Credit:
www.prettypushers.com

Length of Labor: The Friedman Curve



Reference: Perinatology.com:

<http://www.perinatology.com/Reference/glossary/L/Labor.htm>

- Dr. Friedman created the original labor curve in the 1950s, known as the Friedman Curve
- Friedman reported the mean number of hours of active labor among nulliparous women as 4.4-4.9 hours (the upper limit of "normal" was considered 11.7 hours) (Friedman 1954; Friedman 1955; Friedman 1978, all as reported in Neal et al. 2010b)
- Since the 1950s, many researchers have found that the Friedman Curve creates unrealistically fast expectations about the progression of labor (Kilpatrick SJ, Laros RKJ 1989; Albers 1999; Albers LL, Schiff M, Gorwoda JG 1996; Jones M, Larson E 2003; Perl FM, Hunter DJ 1992; Zhang J, Troendle JF, Yancey MK 2002; Zhang et al. 2010a; Zhang et al. 2010b; Zhang et al. 2010c; Laughon et al. 2012; Neal et al. 2010a; Neal et al. 2010b)

Length of Labor

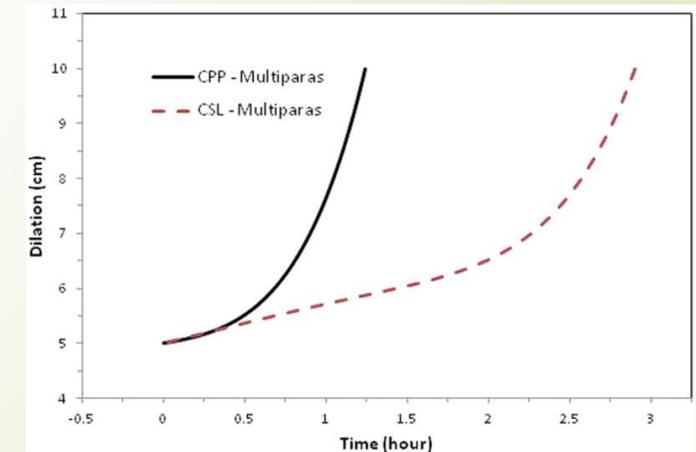
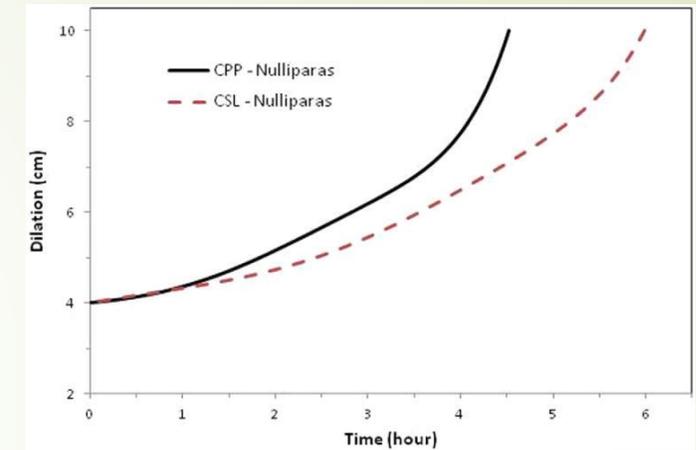
- ▶ A 2002 study found that dilation from 4 cm to 10 cm took approximately 5.5 hours, compared to 2.5 hours under the Friedman Curve (Zhang J, Troendle JF, Yancey MK 2002)
 - ▶ It was not uncommon for the women to experience no cervical dilation for more than two hours in the 2002 study group, until they reached 7 cm
 - ▶ The slowest rates of dilation (at the 5th percentile) were all below 1 cm/hour (Zhang J, Troendle JF, Yancey MK 2002)
- ▶ A 2010 literature review found that for low-risk nulliparous women with spontaneous labor onset, the slowest-yet-normal linear dilation rate is approximately 0.5 cm/hour, when starting at dilatations normally associated with active labor onset (and thus, is likely slower than 0.5 cm/hour in earlier active labor, and faster in more advanced active labor) (Neal et al. 2010b)
- ▶ The weighted mean duration of active labor was 6.0 hours (+ 2 standard deviations = 13.4 hours) and the calculated dilation rate was 1.2 cm/hour (- 2 standard deviations = 0.6 cm/hour) (Neal et al. 2010a)

Length of Labor

- ▶ Researchers reviewed data from a large cohort of women in the 1960s, using data from the National Collaborative Perinatal Project (CPP) and found that:
 - ▶ The active phase of labor for multiparous women may not begin until approximately 5 cm
 - ▶ The nulliparous women in the CPP experienced a slower, more gradual transition to the active phase than the multiparous women, beginning active labor at 6 cm
 - ▶ A two-hour threshold for diagnosing labor arrest may be too short, prior to the woman reaching 6 cm; a four-hour threshold may be too long once the woman has reached 6 cm dilation (Zhang et al. 2010c)
- ▶ The Consortium on Safe Labor (CSL) assessed labor progression in a large multicenter retrospective study and found that:
 - ▶ Labor may take over 6 hours to progress from 4 to 5 cm, and over 3 hours to progress from 5 to 6 cm
 - ▶ Nulliparas and multiparas progressed at similar rates before 6 cm; after 6 cm, labor accelerated much faster among the multiparas (as compared to the nulliparas) (Zhang et al. 2010a)

Length of Labor

- ▶ When data from the CPP cohort (1960s) is compared to that of the CSL cohort (2002-2008 data, with most women in the cohort giving birth from 2005-2007), the researchers found that:
 - ▶ Women in the CSL group were older, heavier (higher BMIs both pre-pregnancy and at delivery), more racially diverse, had higher epidural and oxytocin use, experienced Cesarean rates four times higher than the CPP group, and had heavier babies—despite giving birth earlier, on average, than the CPP group
 - ▶ The CSL group experienced fewer episiotomies and fewer operative vaginal deliveries. Labor is longer in the modern obstetrical cohort, with the first stage of labor in the CSL group lasting longer by a median of 2.6 hours among nulliparas and 2.0 hours among multiparas—even after adjusting for maternal and pregnancy characteristics (Laughon et al. 2012)

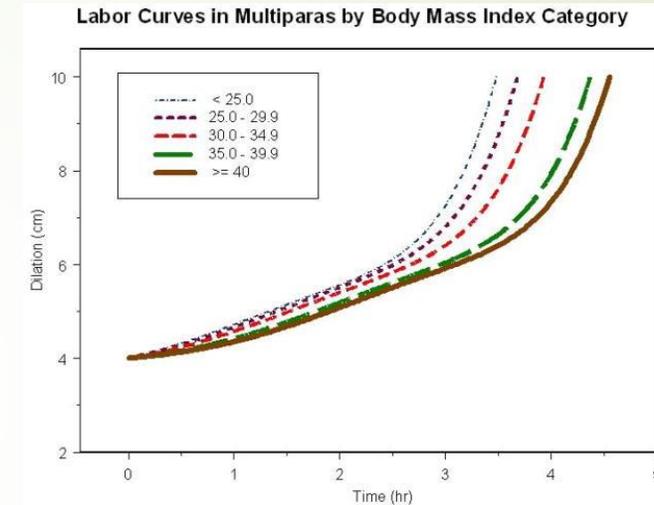
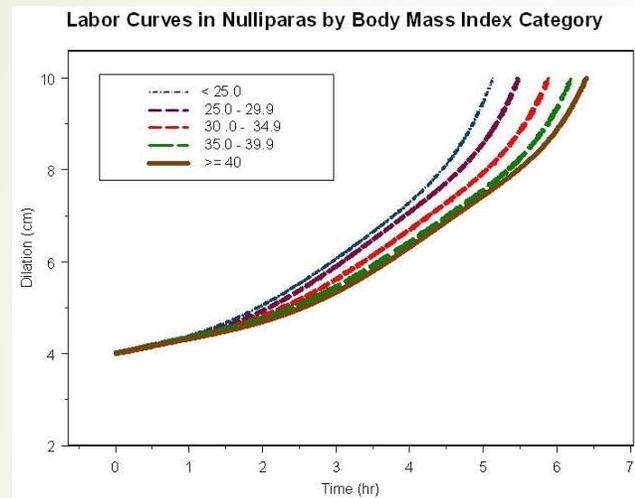


Reference: Laughon et al. 2012

Length of Labor

- ▶ When labor takes longer than care providers expect, they are more likely to suspect dystocia and label the labor as “failure to progress”
- ▶ “Failure to progress” is the most common reason for C-sections in the United States, with 35.4% of primary Cesareans attributable to “failure to progress” (Boyle et al. 2013)
- ▶ In one study, among those women who experienced primary Cesarean for failure to progress, “42.6% of primiparous women and 33.5% of multiparous women never progressed beyond 5 cm dilation” before being taken to the operating room; among women who reached the “pushing phase,” 17.3% of women who had reached the “pushing phase” were given a C-section for arrest of descent at <2 hours (Boyle et al. 2013)
- ▶ In another large study, among women who reach the “pushing phase,” 1 of every 3 C-sections that were performed for “failure to progress during pushing” were performed at <3 hours for first-time moms; 1 out of every 4 C-sections were performed at <2 hours for experienced mothers (Zhang et al. 2010b)
- ▶ However, the 2003 ACOG guidelines define “arrest of descent” as >3 hours for nulliparas with epidurals, and >2 hours for multiparas with epidurals (epidurals can lead to a slower pushing phase) (Zhang et al. 2010b)

Length of Labor and Body Mass Index (BMI)



- As body mass index increases, labor proceeds more slowly (Kominiarek et al. 2011; Norman et al. 2012)
- The time difference to reach 10 cm was 1.2 hours from the lowest to the highest BMI categories for first-time moms (Kominiarek et al. 2011)
- Median time to progress from 4-10 cm:
 - Nulliparas (women who have never given birth):
 - 5.4 hours for BMI $< 25 \text{ kg/m}^2$ versus 7.7 hours for BMI $\geq 40 \text{ kg/m}^2$
 - Multiparas (women who have given birth two or more times):
 - 4.6 hours for BMI $< 25 \text{ kg/m}^2$ versus 5.4 hours for BMI $\geq 40 \text{ kg/m}^2$ (Kominiarek et al. 2011)

Length of Labor

- ▶ Data from the Consortium on Safe Labor demonstrate how: 1) contemporary labor is slower than historically described; and 2) “active labor” does not begin until 6 cm dilation
- ▶ “A prolonged latent phase (e.g., greater than 20 hours in nulliparous women and great than 14 hours in multiparous women) should not be an indication for cesarean delivery” (ACOG 2014)
- ▶ “Given these data, as long as fetal and maternal status are reassuring, cervical dilation of 6 cm should be considered the threshold for the active phase of most women in labor...Further, cesarean delivery for active phase arrest in the first stage of labor should be reserved for women at or beyond 6 cm of dilation with ruptured membranes who fail to progress despite 4 hours of adequate uterine activity, or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change” (ACOG 2014)

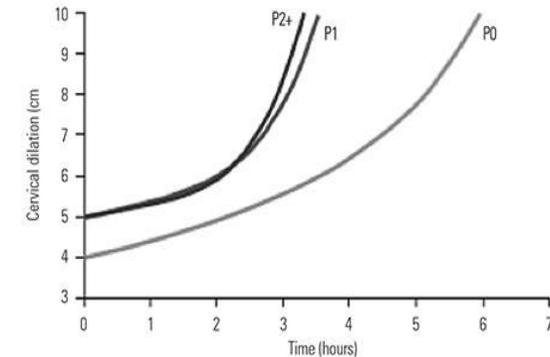


Fig. 4. Average labor curves by parity in singleton term pregnancies with spontaneous onset of labor, vaginal delivery, and normal neonatal outcomes. Abbreviations: P0, nulliparous women; P1, women of parity 1; P2+, women of parity 2 or higher. (Modified from Zhang J, Landy HJ, Branch DW, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. Consortium on Safe Labor. *Obstet Gynecol* 2010;116:1281–7.)

Figure taken from ACOG 2014

Joint Workshop of ACOG, the Society for Maternal Fetal Medicine, and the National Institute for Maternal and Child Health

- ▶ “Care providers should stick to proper definitions of labor arrest, and avoid using the vague term ‘failure to progress’
- ▶ Women should be given an adequate time for both labor and pushing—and an ‘adequate’ time is much longer than what has traditionally been allowed in the past
- ▶ Inductions should only be labeled ‘failed’ after at least 24 hours of Pitocin (plus water broken, if possible)—this clock should not start until after cervical ripening is completed, if needed
- ▶ Women—particularly first-time mothers—with an unripe cervix should not be induced unless the delivery is medically necessary
- ▶ Each care provider should receive quality control feedback on how often they improperly diagnose labor arrest or ‘failed induction’” (Spong et al. 2012)

As the Baby, I Want...



- If birthing in a birthing facility or hospital, I would like for my mom to labor at home until she is in active labor
- My mom to be given an adequate amount of time to labor and to breathe/nudge me down (what other people call “pushing”)
- My mom’s birthing space to be supportive of her natural birth wishes (emergency resuscitation equipment out of plain sight, privacy, “sacred space” with access to props and tubs as requested)
- My mom to have supportive, **patient** care providers who will provide her with comfort measures and the gift of time—no rushing

Birthing Positions

- ▶ Women in developed countries who give birth in a health facility tend to labor in bed—not because of any advantage to the woman or her baby, but because it is more convenient to staff (Lawrence et al. 2009)
- ▶ Most women value the option to be mobile during labor and feel that normal birth processes should not be interfered with unless medically necessary (Declercq et al. 2013; Scotland et al. 2011)
- ▶ Several studies have found advantages to movement in labor, including: reducing fear; helping women cope with discomfort during labor; and helping move the bones of the pelvis to help the baby find the best fit (Adams SS, Eberhard-Gran M, Eskild A 2012; Simkin P, Ancheta R 2011; Storton S 2007; Ondeck 2014)
- ▶ Yet hospital policies often conflict with this need for movement and changing position—especially when continuous fetal monitoring or intravenous infusions are used (Laughon et al. 2012; Hollins-Martin C J, Martin C 2013; Ondeck 2014)



Photo Credit:

<http://www.takingcharge.csh.umn.edu/activities/effective-birthing-positions>

Birth Positions: First Stage of Labor (Thinning and Opening)

- ▶ Women who adopt an upright position (including sitting) or who walk during the first stage of labor experience:
 - ▶ Reduced length of first stage labor (Souza et al. 2006; Lawrence et al. 2013; Adachi K, Shimada M, Usui A 2003; Priddis H, Dahlen H, Schmied V 2012)
 - ▶ Reduced likelihood of having epidural analgesia (Lawrence et al. 2013; Priddis H, Dahlen H, Schmied V 2012)
 - ▶ Lower levels of reported pain (Priddis H, Dahlen H, Schmied V 2012)
 - ▶ Less likelihood of a Cesarean section (Lawrence et al. 2013)
 - ▶ Higher reported satisfaction with their childbirth experience than those women who use semirecumbent or supine positions (Priddis H, Dahlen H, Schmied V 2012)
- ▶ One study found that the first stage of labor is not shortened by using an upright position, but that upright positions are safe and well-accepted by women (Miquelutti MA, Cecatti JG, Makuch MY 2010)
- ▶ Women tend to naturally move around when experiencing contractions/surges, in order to manage any discomfort they may feel (Romano AM, Lothian JA 2008)
- ▶ Upright maternal positions during the first stage of labor is a safe practice that may benefit patients (Souza et al. 2006)

Birth Positions: Second Stage of Labor ("Pushing" or Breathing the Baby Down)

- Several physiological advantages have been associated with assuming an upright position during the second stage of labor:
 - Increasing in the size of the pelvic outlet
 - Better alignment of the baby when passing through the pelvis
 - More efficient uterine contractions (surges)
 - Easing blood flow to the baby by keeping the mother from lying flat on her back
 - Using the force of gravity to help bring the baby down (de Jong et al. 1997; Gupta et al. 2012)
- Despite these significant benefits from using an upright position, women in the United States tend to use the following positions during "pushing":
 - Lying on their backs (68%)
 - Semi-sitting/lying position with the head of the bed raised up (23%)
 - Squatting or sitting (4%)
 - Side lying (3%)
 - Hands-and-knees position (1%) (Declercq et al. 2013)

Birthing Positions: Second Stage of Labor (“Pushing” or Breathing the Baby Down)

- ▶ A 2012 Cochrane review of 22 randomized, controlled trials of more than 7,200 women, found that women who were randomly assigned to upright (sitting, kneeling, squatting) positions during the pushing phase (versus being in a side-lying, semi-sitting/lying, or back-lying position) experienced:
 - ▶ Fewer assisted deliveries (with forceps or vacuum)
 - ▶ Fewer episiotomies
 - ▶ No additional risk of second-degree tears if a birth cushion was used (there was an increased risk of tearing if a birth cushion was not used in an upright pushing position)
 - ▶ Fewer abnormal fetal heart rate patterns (Gupta et al. 2012)
- ▶ An increased risk of blood loss >500 ml was noted in the upright group, but since this was based upon provider observations/estimates, the researchers question this reported outcome (Gupta et al. 2012)



Photo Credit:

www.triadbirthdoula.com

Birthing Positions: Second Stage of Labor (“Pushing” or Breathing the Baby Down)

- ▶ Other studies have found that women who “push” in an upright position experience:
 - ▶ A shorter second stage (Gardosi J, Hutson N, Lynch CB 1989; Golay J, Vedam S, Sorger L 1993); less pain (de Jong et al. 1997; De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004; Golay J, Vedam S, Sorger L 1993)
 - ▶ Less perineal trauma (de Jong et al. 1997; Golay J, Vedam S, Sorger L 1993)
 - ▶ Fewer instrumental deliveries (De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004; Gardosi J, Hutson N, Lynch CB 1989; Golay J, Vedam S, Sorger L 1993)
 - ▶ Fewer episiotomies than those women who deliver on their backs (de Jong et al. 1997; De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004; Golay J, Vedam S, Sorger L 1993)
 - ▶ Greater satisfaction with their birth experience (Nieuwenhuijze et al. 2014; Nieuwenhuijze et al. 2013; ACNM, MANA, NACPM 2012; Green JM, Coupland VA, Kitzinger JV 1990; Gardosi J, Hutson N, Lynch CB 1989)
- ▶ **According to current research, no one position is optimal**, so women should assume positions that feel comfortable to them (Gupta et al. 2012; de Jonge et al. 2007; Kemp et al. 2013; Nieuwenhuijze et al. 2014; Rice Simpson 2006)

Birth Positions: Second Stage of Labor ("Pushing" or Breathing the Baby Down)



Photo Credit: formaternity.com

- ▶ In one Dutch study, when women were offered suggestions for birthing positions by their care provider, they were generally offered squatting or hands-and-knees positions
 - ▶ When women asked for a specific birthing position, it was usually a vertical position, such as squatting or sitting
 - ▶ Women never asked for a semi-recumbent position (Nieuwenhuijze et al. 2013)
- ▶ Two studies found that women with epidural analgesia who remained in an upright position for the second stage of labor experienced: significantly shorter times from epidural insertion to delivery (173 versus 236 minutes) (Karras et al. 2003); and significantly shorter pushing times (51 versus 73 minutes) (Golara et al. 2002) than women who were randomly assigned to remain lying down throughout the "pushing" phase

The Research Shows...



- ▶ **Women without an epidural** who adopt an upright position during the **first stage of labor** experience: shorter labors; less use of epidurals; less pain; fewer C-sections; and greater satisfaction with their births (Souza et al. 2006; Lawrence et al. 2013; Adachi K, Shimada M, Usui A 2003; Priddis H, Dahlen H, Schmied V 2012)
- ▶ **Women without an epidural** who push in an upright position during the **second stage of labor** experience:
 - ▶ A shorter second stage (Gardosi J, Hutson N, Lynch CB 1989; Golay J, Vedam S, Sorger L 1993); less pain (de Jong et al. 1997; De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004; Golay J, Vedam S, Sorger L 1993)
 - ▶ Less perineal trauma (de Jong et al. 1997; Golay J, Vedam S, Sorger L 1993) or no additional risk for second-degree tears when a birthing cushion is used (Gupta et al. 2012)
 - ▶ Fewer instrumental deliveries (Gupta et al. 2012; De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004; Gardosi J, Hutson N, Lynch CB 1989; Golay J, Vedam S, Sorger L 1993)
 - ▶ Fewer episiotomies (Gupta et al. 2012; de Jong et al. 1997; De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004; Golay J, Vedam S, Sorger L 1993)
 - ▶ Fewer abnormal fetal heart rate patterns (Gupta et al. 2012)
 - ▶ Greater satisfaction with their birth experience (Nieuwenhuijze et al. 2014; Nieuwenhuijze et al. 2013; ACNM, MANA, NACPM 2012; Green JM, Coupland VA, Kitzinger JV 1990; Gardosi J, Hutson N, Lynch CB 1989)

The Research Shows...



- Upright positions during the second stage of labor have been found to be beneficial to women with epidural analgesia as well (Karraz et al. 2003; Golara et al. 2002)
- “The results do not justify the continuation of the routine use of the supine position during the second stage of labor” (De Jonge A, Teunissen TAM, Lagro-Janssen ALM 2004)
- Women should push in any position they find most comfortable (Gupta et al. 2012; de Jonge et al. 2007; Kemp et al. 2013; Nieuwenhuijze et al. 2014; Rice Simpson 2006; Dekker 2012)

As the Baby, I Want...



- ▶ My mom to “nudge/push/breathe me down” in whichever position feels most comfortable to her, with an emphasis on more upright positions, and an emphasis on changing positions whenever she feels the need or desire



I am here!

Immediate Skin-to-Skin Contact (SSC) (aka Kangaroo Care)

- ▶ “Separation of human mothers and newborns is unique to the 20th century and is a complete break from natural human history” (Dekker 2013)
- ▶ Kangaroo Care, or Kangaroo Mother Care (KMC) includes three major components:
 - 1) Skin-to-Skin Care/Contact (SSC)
 - 2) Frequent and exclusive (or nearly exclusive) breastfeeding
 - 3) Treating the mother and baby as a dyad—what is sometimes referred to as “couplet care”

(Conde-Agudelo A, Diaz-Rossello JL 2014; Wildner 2012; Dekker 2013)



Photo Credit:
www.ecobabysteps.com

Skin-to-Skin Contact (SSC) (aka Kangaroo Care)

- ▶ Skin-to-skin for the mom-baby dyad following birth has many benefits:
 - ▶ Releases oxytocin (the "love" or "bonding" hormone), thus lowering cortisol levels that may have been created during the birth (Hannah Dahlen, as quoted in Harman T, Wakeford A 2014)
 - ▶ Mom's body warms up to warm baby (i.e., infant temperature stabilization) (Moore et al. 2007; Bergman NJ, Linley LL, Fawcus SR 2004; Hannah Dahlen, as quoted in Harman T, Wakeford A 2014)
 - ▶ Helps baby regulate breathing and blood sugar levels (Hannah Dahlen, as quoted in Harman T, Wakeford A 2014; Moore et al. 2007)
 - ▶ Decreases stress and crying for the baby (Hannah Dahlen, as quoted in Harman T, Wakeford A 2014; Moore et al. 2007)
 - ▶ Neurobehavioral development (Ludington-Hoe SM, Swinth JY 1996)
 - ▶ Increased maternal satisfaction and confidence (Moore et al. 2007)
 - ▶ Improved breastfeeding relationship (Ferber SG, Makhoul IR 2004; Radzyminski 2005; Moore et al. 2007)



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Immediate Skin-to-Skin Contact (SSC) (aka Kangaroo Care)



- ▶ When researchers study **human** mother-newborn contact, keeping mothers and babies together is always considered the “experimental” intervention
- ▶ When researchers study **non-human mammals**, the “experimental” intervention is separating newborns from their mothers (Moore et al. 2012, as reported in Dekker 2013)

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Skin-to-Skin Care (SSC) (aka Kangaroo Care)



Photo Credit:
boys.tajandjoseph.com

- A 2010 Cochrane review found that, for preterm and/or low birthweight babies, SSC “was shown to be effective in reducing the risk of hypothermia when compared to conventional incubator care for infants” (McCall et al. 2010)
- **“Parents are the original incubators!”** (Wildner 2012)
- Other Cochrane reviews have found SSC to be effective at decreasing procedural pain (e.g., heel sticks or lances) for neonates, infants, and young children (Johnston et al. 2014; Pillai Riddell et al. 2011)

Skin-to-Skin Care (SSC) (aka Kangaroo Care)

- ▶ One landmark Russian study found long-term effects of mother-infant interactions following birth:
 - ▶ “Skin-to-skin contact, for 25 to 120 minutes after birth, early suckling, or both positively influenced mother-infant interaction 1 year later when compared with routines involving separation of mother and infant” (Bystrova et al. 2009)
 - ▶ Poorer mother/infant bonding outcomes were found when swaddling was used
 - ▶ Poor mother/infant bonding outcomes from immediate separation were not ameliorated when rooming in was used for the remainder of the hospital stay (Bystrova et al. 2009)

Skin-to-Skin Care (SSC) (aka Kangaroo Care)



Immediate Skin-to-Skin Contact (SSC) (aka Kangaroo Care) and the Microbiome

- ▶ Immediate skin-to-skin for the mom-baby dyad following birth leads to the skin-to-skin transfer of skin bacteria to the baby
- ▶ Baby has to get his or her microbes from somewhere; we want the baby's immune system primed with the right type of bacterium (as discussed, this impacts the choice of birthing environment/facility as well)
- ▶ This is when the baby's immune system learns what is friend versus foe
- ▶ Scientists believe the microbes have one chance to do this—during birth and immediately thereafter: you can correct the “balance” of microbes with probiotics later in life, but you cannot retrain the immune system
- ▶ For additional information about the development of the baby's microbiome, please see: Nicholson L. *Seeding Lifelong Health: The Impact of Pregnancy, Birth, and Infant Care on the Baby's Developing Microbiome*. 2015.

The Research Shows...



- ▶ Immediate or very early SSC has both physiologic and psychologic benefits to the mother-baby dyad, at a very sensitive developmental time for both bonding and the microbiome
- ▶ Early SSC has a positive effect on: breastfeeding, respiration, blood glucose, and lessened crying for the babies; and less breast engorgement and anxiety for the mothers—all with “no apparent short- or long-term negative effects” (Moore et al. 2012)
- ▶ SSC may be even more important for low birthweight babies than for normal babies, as it leads to: lower rates of mortality, sepsis, hypothermia, severe illness, respiratory problems, and long hospital stays, while assisting those low birthweight babies with better growth, breastfeeding, temperature regulation, and bonding with their mothers (Conde-Agudelo A, Diaz-Rossello JL 2014; McCall et al. 2010)

As the Baby, I Want...



- My mom and me to experience immediate skin-to-skin contact
- My mom and me to be left undisturbed for bonding, initial breastfeeding, and the “seeding” of my microbiome from skin contact with my mom during “The Golden Hour” and beyond
- Care providers to do any newborn checks while I am experiencing SSC with my mom—“hands-off” from the care providers, as much as possible

Cord Clamping

- ▶ Nearly 1/3 of a baby's total blood volume is still in the placenta at birth; this is equal to the amount of blood needed to fully perfuse the baby's lungs, liver, and kidneys
 - ▶ 50% of that blood transfuses into the baby by 1 minute of age
 - ▶ 90% of that blood transfuses into the baby by 3 minutes of age (Sloan 2012)
- ▶ The concentration of stem cells in the fetal blood—which play an essential role in the development of the immune, respiratory, cardiovascular, and central nervous systems—is higher at birth than at any other time of life (Sloan 2012)



Three hours old, experiencing the calm of significantly delayed cord clamping.
Photo Credit: en.wikipedia.org

Cord Clamping

- ▶ DCC has also been associated with:
 - ▶ Smoother cardiopulmonary transition at birth (Sloan 2012)
 - ▶ An increase in antioxidant capacity and moderation of inflammatory effects in newborns (Díaz-Castro et al. 2014)
 - ▶ Higher birthweight and hemoglobin concentrations (McDonald et al. 2013)
 - ▶ Increases in iron reserves up to six months after birth; babies have low levels of iron at birth and get very little through breastfeeding (Mercer 2010; Carter et al. 2010; Chaparro 2011; McDonald et al. 2013; Andersson et al. 2011; Ceriani et al. 2010; Morley 2002)
 - ▶ Fewer transfusions for anemia and lower risk of necrotizing enterocolitis (infection of the bowel) (Rabe et al. 2012)



Cord Clamping

- ▶ All of the studies compare immediate cord clamping (ICC) to delayed cord clamping (DCC)—rather than comparing varying cord clamping times with the **normal physiological condition** of “no clamping”
- ▶ Several studies and a 2013 Cochrane review found no relationship between timing of the cord clamp and postpartum hemorrhage—one of the major reasons given for wanting to perform immediate cord clamping (ICC) (McDonald et al. 2013)
- ▶ Blood flow immediately after birth is primarily one-way, from placenta to baby, so concerns about “backflow” to baby are unwarranted
 - ▶ Confirmed by the fact that DCC leads to ~30% greater neonatal blood volume than does ICC (Mercer JS, Skovgaard R 2002; Sloan 2012)
- ▶ Gravity affects the speed of the placental transfusion, but it is still safe to place baby immediately skin-to-skin on mother’s belly while the cord finishes pulsing
 - ▶ Babies held below the level of the placenta receive a full transfusion in ~3 minutes
 - ▶ Babies held above the level of the placenta (e.g., during immediate SSC) receive a full transfusion in ~5 minutes (Mercer JS, Erickson-Owens DA 2012; Yao AC, Lind J 1969; both as reported in Sloan 2012)

Cord Clamping

- ▶ Most studies have found no significant difference in bilirubin levels, which may cause neonatal jaundice, in DCC babies versus ICC babies (Chaparro 2011; Ceriani et al. 2006; McDonald et al. 2013; Andersson et al. 2011; Hutton EK, Hassan ES 2007; Sloan 2012; Fogelson 2009)
- ▶ A 2013 Cochrane review (an update of a 2009 review) found no adverse maternal or neonatal outcomes from DCC, with the possible exception of an increased need for phototherapy as a result of increased bilirubin levels (McDonald et al. 2013)
 - ▶ Of the 40 studies considered for inclusion in this review (15 of which were included), one was an unpublished study by the Cochrane review's lead author; when the unpublished data is removed, the results lose their significance (Sloan 2013)
 - ▶ The two studies added between the 2009 and 2013 Cochrane reviews both found no association between delayed clamping and hyperbilirubinemia requiring phototherapy (Al-Tawil 2012; Andersson 2011; both as reported in Sloan 2013)

Cord Clamping

- ▶ No studies have found a problem with hyperviscosity (i.e., “thick blood”) as a result of DCC (Ceriani et al. 2006; McDonald et al. 2013; Hutton EK, Hassan ES 2007; Sloan 2012)
- ▶ Sick babies, both term and preterm, have been found to have better outcomes with DCC (Sloan 2012; Mercer et al. 2006; Mercer et al. 2010; Kinmond et al. 1993; Rabe et al. 2000; WHO 2015)



Photo Credit:
combatbootmama.com

Cord Clamping

“Late cord clamping is recommended for all births, and the improved iron status associated with it may be particularly relevant for infants living in low-resource settings with reduced access to iron-rich foods.”

- WHO 2015



Photo Credit:
www.appleblossomfamilies.com

The Research Shows...

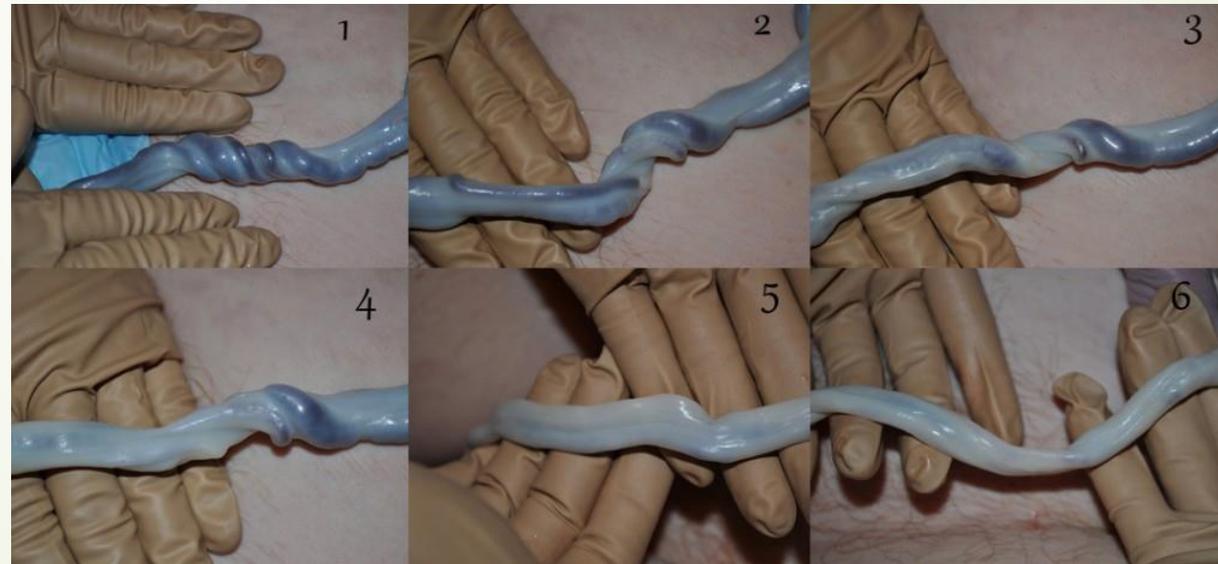


- ▶ “Many maternity care providers continue to clamp the umbilical cord immediately after an uncomplicated vaginal birth, even though the significant neonatal benefits of delayed cord clamping (usually defined as 2 to 3 minutes after birth) are now well known” (Sloan 2012)
- ▶ No adverse maternal or neonatal outcomes have been found, with the possible (and controversial) exception of an increased need for phototherapy due to increased bilirubin levels
- ▶ Benefits to baby include: higher blood volume (up to 30%), higher birth weight, higher hemoglobin concentrations, smoother cardiopulmonary transition, increased number of beneficial stem cells, higher iron stores, increased antioxidant capacity, decreased inflammatory effects, and decreased risk of anemia and necrotizing enterocolitis (Sloan 2012; Mercer JS, Skovgaard R 2002; McDonald et al. 2013; Díaz-Castro et al. 2014; Rabe et al. 2012; Mercer 2010; Carter et al. 2010; Chaparro 2011; Andersson et al. 2011; Ceriani et al. 2010; Morley 2002)

As the Baby, I Want...



- My cord to finish pulsing before it is clamped



Unclamped cord over the course of 15 minutes.
Photo Credit: www.blessedbethebelly.com

Breastfeeding

- Globally, less than 40% of infants under six months of age are exclusively breastfed (WHO 2015)
- “If every child was breastfed within an hour of birth, given only breast milk for their first six months of life, and continued breastfeeding up to the age of two years, about 800,000 child lives would be saved every year” (Black, Victora, Walker, and the Maternal and Child Nutrition Study Group 2013)



Photo Credit: www.birthbootcamp.com

Breastfeeding

- ▶ WHO recommends exclusive breastfeeding for the first six months of life, at which time solid foods can be introduced to complement breastfeeding for up to two years or more
 - ▶ Breastfeeding should begin within an hour of birth
 - ▶ Breastfeeding should be “on demand”—as often as the child wants, day and night
 - ▶ Bottles or pacifiers should be avoided (WHO 2015)



Photo Credit:
www.breastfeeding.see.nhs.uk

Breastfeeding

Breastfeeding is associated with huge short-term and long-term benefits for babies:

- ▶ Provides the nutrients the baby needs for healthy development: “the ideal food for newborns and infants” (WHO 2015)
- ▶ Short-term, decreases the baby’s risk of diarrheal diseases, ear infections, pneumonia and other respiratory illnesses (WHO 2015; Stuebe 2009; WebMD 2015; WHO 2013)
- ▶ Breastfed infants experience appropriate jaw, teeth and speech development as well as overall facial development (LLL 2015)
- ▶ Long-term, decreases the risk of obesity, diabetes, asthma, and allergies (WHO 2015; Stuebe 2009; WebMD 2015; Horta et al. 2007)
- ▶ Breastfed infants perform better on intelligence tests later in life (WHO 2015)
- ▶ Bonding of the mother-baby dyad is significantly enhanced (WHO 2015; WebMD 2015; LLL 2015)



Photo Credit:
www.theplaceforfamilies.com

Breastfeeding



Photo Credit:
www.womenhealth.gov

Breastfeeding is also highly beneficial to the mother:

- Releases prolactin and oxytocin, which helps mom and baby fall in love with one another
- Oxytocin also reduces uterine bleeding after birth and helps mother's uterus return to its pre-pregnancy size (WHO 2015; Stuebe 2009; WebMD 2015)
- Burns extra calories to help mothers lose their excess pregnancy weight (WebMD 2015)
- Associated with a natural (though not fail-safe) method of birth control: 98% protection in the first six months with **exclusive** breastfeeding (WHO 2015)
- Reduces risk of postpartum depression (WHO 2015)
- Long-term, reduces rates of breast cancer and ovarian cancer (LLL 2015)

The Microbiome: Step 3 Breastfeeding



The Microbiome: Step 3

Breastfeeding

- ▶ Breastfeeding is the postnatal method for mother-baby microbial exchange; it “seeds” and selects for particular populations of bacteria (Mueller et al. 2015)
- ▶ Breastmilk has anti-inflammatory hormones, antibodies, and sugars (oligosaccharides), which are indigestible by the baby
- ▶ Those sugars (oligosaccharides) are eaten by the good bacteria that are newly seeded in the baby’s gut; in other words, breastmilk helps the good bacteria thrive
- ▶ By the end of baby’s first year, the microbiome has become more complex and stable
- ▶ The child’s microbiome will be similar to an adult microbiome by three years of age; in other words, the child’s microbiome at three years old is likely to be that individual’s “lifelong signature” of microbiota (Mueller et al. 2015; Groer et al. 2014)

As the Baby, I Want...



- My mom to exclusively breastfeed me for six months, at which time I will be introduced to solid foods
- My mom to continue breastfeeding me from six months up to two years (or longer!) as I also eat solid foods

“The Evidence-Based Baby Model (for Low-Risk Women)”

As the Baby, I Want...



Microbiome Health

- My mom to have a healthy microbiome herself
- To experience an antibiotic-free vaginal birth, at home or surrounded by items brought from home
- To experience immediate skin-to-skin with my mom, followed by couplet care
- To be exclusively breastfed for 6 months or more

Care Provider

- My mom to hire a midwife for prenatal, and labor and delivery care
- My mom to hire a doula to work with her throughout pregnancy and to attend her during labor

Birthing Facility

- My mom to seek midwifery-led care, whether in a hospital-based birthing center or elsewhere
- My mom to consider a birthing center birth or a planned home birth

“The Evidence-Based Baby Model (for Low-Risk Women)” As the Baby, I Want...



Estimated Due Date

- My mom to be provided with a range of likely birth dates, based upon: my mom's LMP, and possibly one early ultrasound completed between 11-14 weeks of gestation

Exercise During Pregnancy

- My mom to exercise regularly both before her pregnancy and during her pregnancy—for her health and mine

Prenatal Ultrasound

- My mom to possibly have one “early ultrasound” (preferably between 11-14 weeks) for gestational dating and to detect whether she is carrying a twin
- My mom to decline late second trimester and all third trimester ultrasounds—including for amniotic fluid index testing or for conducting a BPP—unless there was a reason for concern that she discussed thoroughly with her care provider

“The Evidence-Based Baby Model (for Low-Risk Women)”

As the Baby, I Want...



Prenatal Perineal Massage

- My mom to practice perineal massage on herself, or with the help of her partner
- My mom to feel free to use a warm compress on her perineum during labor to ease me out into the world

Saline Lock

- My mom to politely decline the saline lock, so that she can focus more on her deep relaxation for an easier, gentler birth

Fetal Monitoring

- My mom to have intermittent auscultation during labor

“The Evidence-Based Baby Model (for Low-Risk Women)” As the Baby, I Want...



Length of Labor

- My mom to labor at home until she is in active labor
- My mom to be given an adequate amount of time to labor and to breathe/nudge me down (what other people call “pushing”)
- My mom’s birthing space to be supportive of her natural birth wishes
- My mom to have supportive, **patient** care providers who will provide her with comfort measures and the gift of time—no rushing

Birthing Positions

- My mom to “nudge/push/breathe me down” in whichever position feels most comfortable to her, with an emphasis on more upright positions, and an emphasis on changing positions whenever she feels the need or desire

Skin-to-Skin

- My mom and me to experience immediate skin-to-skin contact
- My mom and me to be left undisturbed for bonding, initial breastfeeding, and the “seeding” of my microbiome from skin contact with my mom during “The Golden Hour” and beyond
- Care providers to do any newborn checks while I am experiencing SSC with my mom—“hands-off” from the care providers, as much as possible

“The Evidence-Based Baby Model
(for Low-Risk Women)”
As the Baby, I Want...



Cord Clamping

- My cord to finish pulsing before it is clamped

Breastfeeding

- My mom to exclusively breastfeed me for six months, at which time I will be introduced to solid foods
- My mom to continue breastfeeding me from six months up to two years (or longer!) as I also eat solid foods

Reference List for Introductory Information

Cabana MD et al. Why don't physicians follow clinical practice guidelines? A framework for improvement. *JAMA*. 1999;282(15):1458-65. <http://www.ncbi.nlm.nih.gov/pubmed/10535437>

Romm A. Two-thirds of US obstetric guidelines are based on weak evidence and bias. October 12, 2011 (accessed online 09/03/2015). http://avivaromm.com/birth_evidence_bias

Wright JD et al. Scientific evidence underlying the American College of Obstetricians and Gynecologists' practice bulletins. *Obstet Gynecol*. 2011;118(3):505-12. <http://www.ncbi.nlm.nih.gov/pubmed/21826038>

Reference List for The Microbiome

- Aagaard K, Ma J, Antony KM, Ganu R, Petrosino J, Versalovic J. The placenta harbors a unique microbiome. *Sci Transl Med*. 2014;6.
- Abrahamsson TR et al. Low diversity of the gut microbiota in infants with atopic eczema. *J Allergy Clin Immunol*. 2012;129:434.
- Abrahamsson TR et al. Low gut microbiota diversity in early infancy precedes asthma at school age. *Clin Exp Allergy*. 2014;44:842.
- Arrieta M-C et al. The intestinal microbiome in early life: health and disease. *Front Immunol*. 2014;5:427.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4155789>
- Azad MB et al. Gut microbiota of healthy Canadian infants: profiles by mode of delivery and infant diet at 4 months. *CMAJ*. 2013;185:385. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3602254/>
- Azad MB et al. Impact of cesarean section delivery and breastfeeding on infant gut microbiota at one year of age. *Allergy Asthma Clin Immunol*. 2014;10(Suppl 1):A24.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4126027>
- Bach JF. The effect of infections on susceptibility to autoimmune and allergic diseases. *N Engl J Med*. 2002;347:911.
- Bailey MT, Lubach GR, Coe CL. Prenatal stress alters bacterial colonization of the gut in infant monkeys. *J Pediatr Gastroenterol Nutr*. 2004;38:414.
- Barrett HL, Dekker Nitert M, Conwell LS, Callaway LK. Probiotics to prevent gestational diabetes mellitus. Cochrane Collaboration review:CD009951. 2014. http://www.cochrane.org/CD009951/PREG_probiotics-to-prevent-gestational-diabetes-mellitus
- Berzirtzoglou E, Tsiotslas A, Weilling GW. Microbiota profile in feces of breast- and formula-fed newborns by using fluorescence in situ hybridization (FISH). *Anaerobe*. 2011;17(6):478.

Reference List for The Microbiome

- Bianconi E et al. An estimation of the number of cells in the human body. *Annals Human Biol.* 2013;40:463–471.
- Biedermann L et al. Smoking cessation induces profound changes in the composition of the intestinal microbiota in humans. *PLoS One.* 2013;8. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3597605/>
- Bisgaard H et al. Reduced diversity of the intestinal microbiota during infancy is associated with increased risk of allergic disease at school age. *J Allergy Clin Immunol.* 2011;128:646.
- Butel MJ et al. Conditions of *Bifidobacterial* colonization in preterm infants: a prospective analysis. *J Pediatr Gastroenterol Nutr.* 2007;44:577.
- Cardwell CR et al. Caesarean section is associated with an increased risk of childhood-onset type 1 diabetes mellitus: a meta-analysis of observational studies. *Diabetologia.* 2008;51:726.
- Carlisle EM, Morowitz MJ. The intestinal microbiome and necrotizing enterocolitis. *Curr Opin Pediatr.* 2013;25:382.
- Dietert R, Dietert J. The Completed Self: an immunological view of the human-microbiome superorganism and risk of chronic diseases. *Entropy.* 2012;14:2036-2065. <http://www.mdpi.com/1099-4300/14/11/2036>
- De Vito P et al. Thyroid hormones as modulators of immune activities at the cellular level. *Thyroid.* 2011;21:879-890.
- DiGiulio DB et al. Microbial prevalence, diversity and abundance in amniotic fluid during preterm labor: a molecular and culture-based investigation. *PLoS One.* 2008;3. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2516597/>
- Dominguez-Bello MG, Blaser MJ, Ley RE, Knight R. Development of the human gastrointestinal microbiota and insights from high-throughput sequencing. *Gastroenterology.* 2011;140:1713.

Reference List for The Microbiome

Dominguez-Bello MG et al. Delivery mode shapes the acquisition and structure of the initial microbiota across multiple body habitats in newborns. *Proc Natl Acad Sci U S A*. 2010;107:11971.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2900693/>

Droste JH et al. Does the use of antibiotics in early childhood increase the risk of asthma and allergic disease? *Clin Exp Allergy*. 2000;30:1548.

Faa G et al. Factors influencing the development of a personal tailored microbiota in the neonate, with particular emphasis on antibiotic therapy. *J Matern Fetal Neonatal Med*. 2013; 26(S2):35.

Fouhy F et al. High-throughput sequencing reveals the incomplete, short-term recovery of infant gut microbiota following parenteral antibiotic treatment with ampicillin and gentamicin. *Antimicrob Agents Chemother*.

2012;56:5811. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3486619/>

Galley J et al. Maternal obesity is associated with alterations in the gut microbiome in toddlers. *PLoS One*.

2014;9(11):e113026. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4237395>

Gewolb IH, Schwalbe RS, Taciak VL, Harrison TS, Panigrahi P. Stool microflora in extremely low birthweight infants.

Arch Dis Child Fetal Neonatal Ed. 1999;80. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1720923/>

Groer MW et al. Development of the preterm infant gut microbiome: a research priority. *Microbiome*. 2014;2:38.

Hällström M, Eerola E, Vuento R, Janas M, Tammela O. Effects of mode of delivery and necrotising enterocolitis on the intestinal microflora in preterm infants. *Eur J Clin Microbiol Infect Dis*. 2004;23:463.

Harman T and Wakeford A. MICROBIRTH: Revealing the microscopic events during childbirth that could hold the key to the future of humanity. DVD. Alto Films: 2014.

Reference List for The Microbiome

Horvath Marques A et al. The influence of maternal prenatal and early childhood nutrition and maternal prenatal stress on offspring immune system development and neurodevelopmental disorders. *Front Neurosci.* 2013;7:120.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3728489>

Hviid A, Svanstrom H, Frisch M. Antibiotic use and inflammatory bowel diseases in childhood. *Gut.* 2011;60:49.

Hwang JS, Im CR, Im SH. Immune disorders and its correlation with gut microbiome. *Immune Netw.* 2012;12:129.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3467411/>

Jakobsson HE et al. Decreased gut microbiota diversity, delayed Bacteroidetes colonization and reduced Th1 responses in infants delivered by caesarean section. *Gut.* 2014;63:559.

Jimenez E et al. Is meconium from healthy newborns actually sterile? *Res Microbiol.* 2008;159:187.

Jimenez E et al. Isolation of commensal bacteria from umbilical cord blood of healthy neonates born by cesarean section. *Curr Microbiol.* 2005;51:270.

Keski-Nisula L et al. Maternal intrapartum antibiotics and decreased vertical transmission of Lactobacillus to neonates during birth. *Acta Paediatr.* 2013;102:480–485.

Khafipour E, Ghia JE. Mode of delivery and inflammatory disorders. *J Immunol Clin Res.* 2013;1:1004.

Kondrashova A, Hyoty H. Role of viruses and other microbes in the pathogenesis of type 1 diabetes. *Int Rev Immunol.* 2014;33(4):284.

Kozyrskyj AL, Bahreinian S, Azad MB. Early life exposures: impact on asthma and allergic disease. *Curr Opin Allergy Clin Immunol.* 2011;11:400.

Reference List for The Microbiome

Lahtinen SJ et al. Prenatal probiotic administration can influence *Bifidobacterium* microbiota development in infants at high risk of allergy. *J Allergy Clin Immunol*. 2009;123:499.

Li M, Wang M, Donovan SM. Early development of the gut microbiome and immune-mediated child disorders. *Semin Reprod Med*. 2014;32:74.

Lozupone CA et al. Diversity, stability and resilience of the human gut microbiota. *Nature*. 2012;489:220.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3577372/>

Mackie RI, Sghir A, Gaskins HR. Developmental microbial ecology of the neonatal gastrointestinal tract. *Am J Clin Nutr*. 1999;69:S1035–1045.

Madan JC et al. Gut microbial colonisation in premature neonates predicts neonatal sepsis. *Arch Dis Child Fetal Neonatal Ed*. 2012;97. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3724360/>

Martino D, Prescott S. Epigenetics and prenatal influences on asthma and allergic airways disease. *Chest*. 2011;129:640-47.

Metsala J et al. Mother's and offspring's use of antibiotics and infant allergy to cow's milk. *Epidemiology*. 2013;24:303.

Morse NL. Benefits of docosahexaenoic acid, folic acid, vitamin D and iodine on foetal and infant brain development and function following maternal supplementation during pregnancy and lactation. *Nutrients*. 2012;4(7):799-840. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3407995>

Mueller NT et al. The infant microbiome development: mom matters. *Trends Mol Med*. 2015;21(2):109-117. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4464665>

Munyaka PM, Khafipour E, Ghia J-E. External influence of early childhood establishment of gut microbiota and subsequent health implications. *Front Pediatr*. 2014;2:109. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4190989>

Reference List for The Microbiome

O'Connor TG et al. Prenatal maternal anxiety predicts reduced adaptive immunity in infants. *Brain Behav Immun.* 2013;32:21-28. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3686987/>

Penders J et al. Factors influencing the composition of the intestinal microbiota in early infancy. *Pediatrics.* 2006;118:511–2110.

Penders J et al. Establishment of the intestinal microbiota and its role for atopic dermatitis in early childhood. *J Allergy Clin Immunol.* 2013;132:601.

Pertea M, Salzberg SL. Between a chicken and a grape: estimating the number of human genes. *Genome Biol.* 2010;11:206. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2898077/>

Ravel J et al. Human microbiome science: vision for the future, Bethesda, MD, July 24 to 26, 2013. *Microbiome.* 2014;2:16. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4102747/>

Roberts SE et al. Perinatal and early life risk factors for inflammatory bowel disease. *World J Gastroenterol.* 2011;17:743. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3042652/>

Romero, R et al. The composition and stability of the vaginal microbiota of normal pregnant women is different from that of non-pregnant women. *Microbiome.* 2014; 2:4. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3916806>

Roth C et al. Folic acid supplements in pregnancy and severe language delay in children. *JAMA.* 2011;306:1566-1573. <http://www.ncbi.nlm.nih.gov/pubmed/21990300>

Russell SL et al. Early life antibiotic-driven changes in microbiota enhance susceptibility to allergic asthma. *EMBO Rep.* 2012;13(5):440–447. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3343350/>

Reference List for The Microbiome

Sakata H, Yoshioka H, Fujita K. Development of the intestinal flora in very low birth weight infants compared to normal full-term newborns. *Eur J Pediatr*. 1985;144.

Satokari R et al. *Bifidobacterium* and *Lactobacillus* DNA in the human placenta. *Lett Appl Microbiol*. 2009;48:8.

Savage DC. Microbial ecology of the gastrointestinal tract. *Annu Rev Microbiol*. 1977;31:107–133.

Schmidt R et al. Maternal periconceptional folic acid intake and risk of autism spectrum disorders and developmental delay in the CHARGE (Childhood Autism Risks from Genetics and Environment) case-control study. *Am J Clin Nutr*. 2012;96:80-89.

<http://www.ncbi.nlm.nih.gov/pubmed/?term=Maternal+periconceptional+folic+acid+intake+and+risk+of+autism+spectrum+disorders+and+developmental+delay+in+the+CHARGE+%28Childhood+Autism+Risks+from+Genetics+and+Environment%29+case-control+study>

Schulfer A, Blaser MJ. Risks of antibiotic exposures early in life on the developing microbiome. *PLoS Pathog*. 2015;11(7):e1004903. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4489621>

Shaw SY, Blanchard JF, Bernstein CN. Association between the use of antibiotics in the first year of life and pediatric inflammatory bowel disease. *Am J Gastroenterol*. 2010;105:2687.

Sloan M. Unintended consequences: cesarean section, the gut microbiota, and child health. *Science & Sensibility*. 2012 (July 12). <http://www.scienceandsensibility.org/unintended-consequences-cesarean-section-the-gut-microbiota-and-child-health/>. Accessed online 09/25/15.

Song SJ, Dominguez-Bello MG, Knight R. How delivery mode and feeding can shape the bacterial community in the infant gut. *CMAJ*. 2013;185(5):373-374. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3602250>

Reference List for The Microbiome

- Stensballe LG et al. Use of antibiotics during pregnancy increases the risk of asthma in early childhood. *J Pediatr*. 2013;162:832.
- Surén P et al. Autism spectrum disorder, ADHD, epilepsy, and cerebral palsy in Norwegian children. *Pediatrics*. 2012;130:e152-e158. <http://www.ncbi.nlm.nih.gov/pubmed/22711729>
- Thavagnaman S et al. A meta-analysis of the association between caesarean section and childhood asthma. *Clin Exp Allergy*. 2008;38:629.
- Torraza RM, Neu J. The altered gut microbiome and necrotizing enterocolitis. *Clin Perinatol*. 2013;40:93.
- Trumpff C et al. Mild iodine deficiency in pregnancy in Europe and its consequences for cognitive and psychomotor development of children: a review. *J Trace Elem Med Biol*. 2013;27:174-183.
- Turnbaugh PJ et al. The human microbiome project. *Nature*. 2007;449:804–810. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3709439/>
- Villarreal AA, Aberger FJ, Benrud R, Gundrum JD. Use of broad-spectrum antibiotics and the development of irritable bowel syndrome. *WMJ*. 2012;111:17–20.
- Wang TT et al. Cutting edge: 1,25-dihydroxyvitamin D3 is a direct inducer of antimicrobial peptide gene expression. *J Immunol*. 2004;173:2909-2912.
- Westerbeek EA et al. The intestinal bacterial colonization in preterm infants: a review of the literature. *Clin Nutr*. 2006; 25:361.
- Wlodarska M et al. Early life antibiotic-driven changes in microbiota enhance susceptibility to allergic asthma. *EMBO Rep*. 2012;13:440.

Reference List for Selecting a Care Provider

American College of Nurse-Midwives (ACNM). Midwifery: Evidence-based practice. A summary of research on midwifery practice in the United States. 2012.

<http://www.midwife.org/acnm/files/cclibraryfiles/filename/000000002128/midwifery%20evidence-based%20practice%20issue%20brief%20finalmay%202012.pdf>

American College of Nurse-Midwives (ACNM). The ACNM benchmarking project results summary. 2012b.

<http://www.midwife.org/benchmarking>. Accessed 09/20/15.

American College of Nurse-Midwives (ACNM). Evidence-based practice: pearls of midwifery®. A presentation by the American College of Nurse-Midwives. 2014. <http://www.midwife.org/pearls>. Accessed 09/18/15.

Caton D et al. The nature and management of labor pain: executive summary. *Am J Obstet Gynecol*. 2002;186(5 Suppl Nature):S1-15.

Declercq ER et al. Listening to mothers II: report of the second national survey of women's childbearing experiences. New York: Childbirth Connection. 2006. http://www.childbirthconnection.org/pdfs/LTMII_report.pdf. Accessed 09/20/15.

Declercq ER et al. Listening to mothers III: pregnancy and birth. New York: Childbirth Connection. 2013.

http://transform.childbirthconnection.org/wp-content/uploads/2013/06/LTM-III_Pregnancy-and-Birth.pdf. Accessed 09/20/15.

Dekker R. The evidence for doulas. Evidence Based Birth® review. 2013. <http://evidencebasedbirth.com/the-evidence-for-doulas/>

DONA International. What is a doula? DONA website, accessed on 12/01/15. <http://www.dona.org/mothers/>

Gruber KJ, Cupito SH, Dobson CF. Impact of doulas on healthy birth outcomes. *J of Perinatal Ed*. 2013;22(1):49-58.

Reference List for Selecting a Care Provider

Hamilton BE et al. Births: final data for 2009. *Natl Vital Stat Rep.* 2010;59(3):1-19.
http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_03.pdf.

Hodnett ED. Pain and women's satisfaction with the experience of childbirth: a systematic review. *Am J Obstet Gynecol.* 2002;186(5 Suppl Nature):S160-172.

Hodnett ED, Gates S, Hofmeyr GJ, Sakala C. Continuous support for women during childbirth. Cochrane Collaboration review:CD003766. 2013. http://www.cochrane.org/CD003766/PREG_continuous-support-for-women-during-childbirth

Hofmeyr JG et al. Companionship to modify the clinical birth environment: effects on progress and perceptions of labour, and breastfeeding. *BJOG.* 1991;98:756-764.

Joint Statement of Practice Relations between Obstetrician-Gynecologists and Certified Nurse-Midwives/Certified Midwives. 2011.

Kozhimannil KB et al. Potential benefits of increased access to doula support during childbirth. *AJMC.* 2014;20(8).
<http://www.ajmc.com/journals/issue/2014/2014-vol20-n8/potential-benefits-of-increased-access-to-doula-support-during-childbirth/P-1>

Martin JA et al. Births: final data for 2013. *National Vital Statistics Reports.* 2015;64(1).

Newhouse RP et al. Advanced practice nursing outcomes 1990-2008: a systematic review. *Nurs Econ.* 2011;29(5):1-22.

Oakley D et al. Processes of care, comparisons of certified nurse midwives and obstetricians. *J Nurse Midwifery.* 1995;5:399-409.

Reference List for Selecting a Care Provider

Renfrew MJ et al. Midwifery: an executive summary for *The Lancet's* series. *The Lancet Series on Midwifery*. 2014. <http://www.thelancet.com/series/midwifery>. Accessed 09/18/15.

Rooks JP. The midwifery model of care. *J Nurse Midwifery*. 1999;44(4):370-374.

Sandall J et al. Midwife-led continuity models versus other models of care for childbearing women. Cochrane Collaboration review:CD004667. 2015. http://www.cochrane.org/CD004667/PREG_midwife-led-continuity-models-versus-other-models-care-childbearing-women

Shaw-Battista J et al. Obstetrician and nurse-midwife collaboration: successful public health and private practice partnership. *Obstet Gynecol*. 2011;118(13):663-672.

Tumblin A, Simkin P. Pregnant women's perceptions of their nurse's role during labor and delivery. *Birth*. 2001;28(1):52-56.

United Nations Fund for Population Activities (UNFPA). The state of the world's midwifery: a universal pathway, a woman's right to health. 2014. <http://www.unfpa.org/sowmy>. Accessed 09/18/15.

Reference List for Selecting a Birthing Location

American College of Nurse-Midwives (ACNM). Midwifery: evidence-based practice. A summary of research on midwifery practice in the United States. 2012.

Andrews RM. The national hospital bill: the most expensive conditions by payer, 2006. Statistical brief no. 59. Rockville, MD: Agency for Healthcare Research and Quality. 2008

Arrieta M-C et al. The intestinal microbiome in early life: health and disease. *Front Immunol*. 2014;5:427. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4155789>

Brocklehurst P et al. Perinatal and maternal outcomes by planned place of birth for healthy women with low risk pregnancies: the Birthplace in England national prospective cohort study. *BMJ*. 2011;343.

Cheyney M et al. Outcomes of care for 16,924 planned home births in the United States: the Midwives Alliance of North America statistics project, 2004 to 2009. *J Midwifery Womens Health*. 2014;59(1):17-27.

Collaborative survey of perinatal loss in planned and unplanned home births: Northern Region Perinatal Mortality Survey Coordinating Group. *BMJ*. 1996;313(7068):1306-09. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2352740/>

Corry MP et al. Caesar's ghost: the effect of the rising rate of csections on health care costs and quality. Washington, DC: National Health Policy Forum, March 30, 2012.

Declercq E et al. Where to give birth? Politics and the place of birth. In: De Vries R, et al., editors. *Birth by Design*. New York: NY: Routledge. 2001:7-27.

Declercq ER et al. Listening to mothers II: Report of the second national US Survey of women's childbearing experiences. *J of Perinatal Ed*. 2007;16:9-14. http://www.childbirthconnection.org/pdfs/LTMII_report.pdf

Reference List for Selecting a Birthing Location

De Jonge A et al. Perinatal mortality and morbidity up to 28 days after birth among 743 070 low-risk planned home and hospital births: a cohort study based on three merged national perinatal databases. *BJOG*. 2014.

Dekker R. Evidence confirms birth centers provide top-notch care. National Birth Center Study II, American Association of Birth Centers website. <http://www.birthcenters.org/?page=NBCSII>. Accessed online 09/18/15.

Dekker R. The evidence for doulas. Evidence Based Birth® review. 2013. <http://evidencebasedbirth.com/the-evidence-for-doulas/>

Gibbons L et al. The global numbers and costs of additionally needed and unnecessary caesarean sections performed per year: overuse as a barrier to universal coverage. Background Paper 30. World Health Report. Geneva: World Health Organization. 2010.

Hamilton BE et al. Births: final data for 2009. *Natl Vital Stat Rep*. 2010;59(3):1-19. http://www.cdc.gov/nchs/data/nvsr/nvsr59/nvsr59_03.pdf.

Hodnett ED, Downe S, Walsh D. Alternative versus conventional institutional settings for birth. Cochrane Collaboration review:CD000012. 2012. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000012.pub4/abstract>

Hutton EK, Reitsma AH, Kaufman K. Outcomes associated with planned home and planned hospital births in low-risk women attended by midwives in Ontario, Canada, 2003-2006: a retrospective cohort study. *Birth*. 2009;36(3):180-189.

Jackson DJ et al. Outcomes, safety, and resource utilization in a collaborative care birth center. *Am J Public Health*. 2003;93(6):999-1006.

Janssen PA et al. Outcomes of planned home birth with registered midwife versus planned hospital birth with midwife or physician. *CMAJ*. 2009;181(6-7):377-383.

Reference List for Selecting a Birthing Location

Joint statement of practice relations between obstetrician-gynecologists and certified nurse-midwives/certified midwives. 2011.

Kozhimannil KB et al. Potential benefits of increased access to doula support during childbirth. *AJMC*. 2014;20(8). <http://www.ajmc.com/journals/issue/2014/2014-vol20-n8/potential-benefits-of-increased-access-to-doula-support-during-childbirth/P-1>

Laughon SK et al. Induction of labor in a contemporary obstetric cohort. *AJOG*. 2012;206:486e481-489.

MacDorman M, Declercq E, Mathews TJ. Recent trends in out-of-hospital births in the United States. *J Midwifery Womens Health*. 2013;58(5):494-501.

MacDorman MF, Mathews TJ, Declercq E. Trends in out-of-hospital births in the United States, 1990-2012. *NCHS Data Brief*. 2014;144:1-8.

Martin JA et al. Births: final data for 2010. *National Vital Statistics Reports*. 2012;16.

Martin JA, Hamilton BE, Sutton PD. Births: final data for 2006. *National Vital Statistics Reports*. 2009;57.

Murphy SL, XU J, Kochanek KD. Deaths: preliminary data for 2010. *Natl Vital Stat Rep*. 2010;60(4):1-69. http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_04.pdf

National Institute for Health and Care Excellence (NICE). Intrapartum care. Care of healthy women and their babies during childbirth. Vol. 190. London: NICE. 2014.

National Institute for Health and Care Excellence (NICE). NICE confirms midwife-led care during labour is safest for women with straightforward pregnancies. Press release about the new Vol. 190 guidance. 2014b (3 December 2014). <http://www.nice.org.uk/news/press-and-media/midwife-care-during-labour-safest-women-straightforward-pregnancies>. Accessed 09/23/15.

Reference List for Selecting a Birthing Location

Office for National Statistics, Births in England and Wales by Characteristics of Birth 2. 2012.

<http://www.ons.gov.uk/ons/rel/vsob1/characteristics-of-birth-2--england-and-wales/2012/sb-characteristics-of-birth-2.html>. Accessed online 09/23/15.

Olsen O, Clausen JA. Planned hospital birth versus planned home birth. Cochrane Collaboration review:CD000352. 2012. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000352.pub2/abstract>

Renfrew MJ et al. Midwifery and quality care: findings from a new evidence-informed framework for maternal and newborn care. *The Lancet*. 2014;384(9948):1129-1145.

Renfrew MJ et al. Midwifery: an executive summary for *The Lancet's* series. *The Lancet Series on Midwifery*. 2014b. <http://www.thelancet.com/series/midwifery>

Rooks JP et al. Outcomes of care in birth centers. The national birth center study. *New England Journal of Medicine*. 1989;321:1804-1811.

Royal College of Obstetricians and Gynaecologists/Royal College of Midwives. Joint statement no. 2. 2007.

Stapleton SR, Osborne C, Illuzzi J. Outcomes of care in birth centers: demonstration of a durable model. *J Midwifery Womens Health*. 2013. <http://onlinelibrary.wiley.com/doi/10.1111/jmwh.12003/epdf>

Truven Health Analytics. The cost of having a baby in the United States: Truven Health Analytics Marketscan Study. 2013.

Vedam S et al. The Canadian birth place study: examining maternity care provider attitudes and interprofessional conflict around planned home birth. *BMC Pregnancy Childbirth*. 2014;14:353.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4287472>

Zielinski R, Ackerson K, Kane Low L. Planned home birth: benefits, risks, and opportunities. *Int J Womens Health*. 2015;7:361-377.

Reference List for Estimated Due Date

American Congress of Obstetricians and Gynecologists. Leading women's health organizations partner to release standardized approach for estimating due dates. 2014a. Published September 22, 2014.

<http://www.acog.org/About-ACOG/News-Room/News-Releases/2014/Leading-Womens-Health-Organizations-Release-Standardized-Approach-for-Estimating-Due-Dates>. Accessed online 12/03/2015.

American Congress of Obstetricians and Gynecologists. Committee opinion no 611: method for estimating due date. *Obstet Gynecol*. 2014b;124(4): 863-866. <http://www.ncbi.nlm.nih.gov/pubmed/25244460>

Backe B, Nakling J. Term prediction in routine ultrasound practice. *Acta Obstet Gynecol Scand*. 1994;73:113-118.

Baskett TF, Nagele F. Naegele's rule: a reappraisal. *BJOG*. 2000;107(11):1433-1435. As quoted in Dekker 2015.

<http://www.ncbi.nlm.nih.gov/pubmed/11117775>

Dekker R. Induction for going past your due date: what does the evidence say? Evidence Based Birth review. 2015.

www.evidencebasedbirth.com/duedates

Grzybowski S, Nout R, Kirkham CM. Maternity care calendar wheel. *Canadian Family Physician*. 1999;45:661-666.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2328417/?page=1>

Khambalia AZ et al. Predicting date of birth and examining the best time to date a pregnancy. *Int J Gynaecol Obstet*. 2013;123(2):105-109. <http://www.ncbi.nlm.nih.gov/pubmed/23932061>

Mongelli M, Wilcox M, Gardosi J. Estimating the date of confinement: ultrasonographic biometry versus certain menstrual dates. *Am J Obstet Gynecol*. 1996;174:278-281.

Olsen O. Expected day of delivery (correspondence). *Br J Obstet Gynaecol*. 1999;106:1000.

Saunders N, Paterson C. Can we abandon Naegele's rule? *The Lancet*. 1991;337(8741):600-601.

WebMD. Estimating your due date. <http://www.webmd.com/women/estimate-due-date>. Accessed online 12/03/2015.

Reference List for Exercise During Pregnancy

- Evenson KR et al. Guidelines for physical activity during pregnancy: comparisons from around the world. *Am J Lifestyle Med*. 2014;8(2):102-121. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4206837/>
- Foxcroft KF et al. Exercise in obese pregnant women: the role of social factors, lifestyle and pregnancy symptoms. *BMC Pregnancy Childbirth*. 2011;11(4). <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3025919/>
- Kramer MS, McDonald SW. Aerobic exercise for women during pregnancy. Cochrane Collaboration review:CD000180. 2006. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000180.pub2/abstract>
- Mottola MF et al. Nutrition and exercise prevent excess weight gain in overweight pregnant women. *Med Sci Sports Exerc*. 2010;42(2):265-272. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2886034/>
- Muktabhant B et al. Diet or exercise, or both, for preventing excessive weight gain in pregnancy. Cochrane Collaboration review:CD007145. 2014. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD007145.pub3/abstract>
- Padayachee C, Coombes JS. Exercise guidelines for gestational diabetes mellitus. *World Journal of Diabetes*. 2015;6(8):1033-1044. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4515443/>
- Streuling I et al. Physical activity and gestational weight gain: a meta-analysis of intervention trials. *BJOG*. 2010;118(3):278-284.
- Symons Downs D et al. Physical activity and pregnancy: past and present evidence and future recommendations. *Res Q Exerc Sport*. 2012;83(4):485-502. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3563105/>
- Tobias DK et al. Physical activity before and during pregnancy and risk of gestational diabetes mellitus: a meta-analysis. *Diabetes Care*. 2011;34(1):223-229.
- Université de Montréal. Exercise during pregnancy gives newborn brain development head start. *U de M Nouvelles*. November 11, 2013. <http://www.nouvelles.umontreal.ca/udem-news/news/20131111-exercise-during-pregnancy-gives-newborn-brain-development-a-head-start.html>. Accessed online 12/04/15.

Reference List for Prenatal Ultrasound

Abdallah Y et al. Limitations of current definitions of miscarriage using mean gestational sac diameter and crown-rump length measurements: a multicenter observational study. *Ultrasound Obstet Gynecol*. 2011;38(5):497-502.

ACOG. Practice bulletin no. 101: ultrasonography in pregnancy. *OBGYN*. 2009;113(2):451-461.

Alfirevic Z, Stampalija T, Gyte GML. Fetal and umbilical Doppler ultrasound in high-risk pregnancies. Cochrane Collaboration review:CD007529. 2013. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD007529.pub3/abstract>

Alfirevic Z, Stampalija T, Medley N. Fetal and umbilical Doppler ultrasound in normal pregnancy. Cochrane Collaboration review:CD001450. 2015. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD001450.pub4/abstract>

Bolten K et al. Antenatal diagnosis of nuchal cord. *Ultrasound Obstet Gynecol*; 2009;34(Suppl. 1):146.

Borsellino et al. False-positive rate in prenatal diagnosis of surgical anomalies. *J Pediatr Surg*. 2006;41 (4):826-829. <http://www.ncbi.nlm.nih.gov/pubmed/16567202>.

Bricker L, Medley N, Pratt JJ. Routine ultrasound in late pregnancy (after 24 weeks' gestation). Cochrane Collaboration review:CD001451. 2015. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD001451.pub4/abstract>

Cohain JS. Nuchal cords are necklaces, not nooses. *Midwifery Today*. 2010;93:46-48, 67-68.

Cohain JS. Prenatal ultrasound does not improve perinatal outcomes. *Midwifery Today*. 2012;102.

Declercq ER et al. Listening to mothers III: pregnancy and birth. New York: Childbirth Connection. 2013. http://transform.childbirthconnection.org/wp-content/uploads/2013/06/LTM-III_Pregnancy-and-Birth.pdf

Dekker R. Induction for going past your due date: what does the evidence say? Evidence Based Birth review. 2015. www.evidencebasedbirth.com/duedates

Hargreaves K et al. Is the use of symphysis-fundal height measurement and ultrasound examination effective in detecting small or large fetuses? *J Obstet Gynaecol*. 2011;31 (5):380-383.

Reference List for Prenatal Ultrasound

Haws RA et al. Reducing stillbirths: screening and monitoring during pregnancy and labour. *BMC Pregnancy Childbirth*. 2009;9(Suppl 1):S5. <http://www.biomedcentral.com/1471-2393/9/S1/S5>

Khambalia AZ et al. Predicting date of birth and examining the best time to date a pregnancy. *Int J Gynaecol Obstet*. 2013;123(2):105-109. <http://www.ncbi.nlm.nih.gov/pubmed/23932061>

Lalor JG et al. Biophysical profile for fetal assessment in high risk pregnancies. Cochrane Collaboration review:CD000038. 2008. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000038.pub2/abstract>

Miller DL. Safety assurance in obstetrical ultrasound. *Semin Ultrasound CT MR*. 2008;29(2):156-164.

Stampalija T, Gyte GML, Alfirevic Z. Utero-placental Doppler ultrasound for improving pregnancy outcome. Cochrane Collaboration review:CD008363. 2010. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008363.pub2/abstract>

Taipale P, Hiilesmaa V. Predicting delivery date by ultrasound and last menstrual period in early gestation. *Obstet Gynecol*. 2001;97(2):189-194. <http://www.ncbi.nlm.nih.gov/pubmed/11165580>

Whitworth M, Bricker L, Mullan C. Ultrasound for fetal assessment in early pregnancy. Cochrane Collaboration review:CD007058. 2015. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD007058.pub3/abstract>

Reference List for Prenatal Perineal Massage

Aasheim V et al. Perineal techniques during the second stage of labour for reducing perineal trauma. Cochrane Collaboration review:CD006672. 2011.

<http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006672.pub2/abstract>

Beckmann MM, Stock OM. Antenatal perineal massage for reducing perineal trauma. Cochrane Collaboration review:CD005123. 2013. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD005123.pub3/abstract>

Dahlen HG et al. Perineal outcomes and maternal comfort related to the application of perineal warm packs in the second stage of labor: a randomized controlled trial. *Birth*. 2007;34(4):282-290.

Soong B, Barnes M. Maternal position at midwife-attended birth and perineal trauma: is there an association? *Birth*. 2005;32(3):164-169.

Reference List for Saline Lock

Dekker R. Evidence for the saline lock during labor. Evidence Based Birth review. 2012.
<http://evidencebasedbirth.com/the-saline-lock-during-labor/>

Reference List for Fetal Monitoring

Alfirevic Z, Devane D, Gyte GML. Comparing continuous electronic fetal monitoring in labour (cardiotocography, CTG) with intermittent listening (intermittent auscultation, IA). Cochrane Collaboration review:CD006066. 2013.

http://www.cochrane.org/CD006066/PREG_comparing-continuous-electronic-fetal-monitoring-in-labour-cardiotocography-ctg-with-intermittent-listening-intermittent-auscultation-ia

Banta HD, Thacker SB. Electronic fetal monitoring. *International Journal of Technology Assessment in Health Care*. 2002;18(4):762-770.

<http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=136646&fileId=S0266462302000570>

Declercq ER et al. Listening to mothers II: report of the second national U.S. survey of women's childbearing experiences: conducted January-February 2006 for Childbirth Connection by Harris Interactive in partnership with Lamaze International. *J Perinat Educ*. 2007;16(4):15-17. http://www.childbirthconnection.org/pdfs/LTMII_report.pdf

Devane D et al. Cardiotocography versus intermittent auscultation of fetal heart on admission to labour ward for assessment of fetal wellbeing. Cochrane Collaboration review: CD005122. 2012.

<http://www.ncbi.nlm.nih.gov/pubmed/22336808>

Herbst A, Ingamarsson I. Intermittent versus continuous electronic monitoring in labour: a randomized study. *Br J Obstet Gynaecol*. 1994;101(8):663-668. <http://www.ncbi.nlm.nih.gov/pubmed/7947499>

Macones GA et al. The 2008 National Institute of Child Health and Human Development workshop report on electronic fetal monitoring: update on definitions, interpretation, and research guidelines. *Journal of Obstetric, Gynecologic & Neonatal Nursing*. 2008;37:510-515. <http://onlinelibrary.wiley.com/doi/10.1111/j.1552-6909.2008.00284.x/full>

Thacker SB, Stroup DF, Peterson HB. Efficacy and safety of intrapartum electronic fetal monitoring: an update. *Obstetrics & Gynecology*. 1995;86(4)Part 1:613-620.

<http://www.sciencedirect.com/science/article/pii/S0029784495800271>

Thacker SB, Stroup D, Chang M. Continuous electronic heart rate monitoring for fetal assessment during labor. Cochrane Collaboration review:CD000063. 2001.

<http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000063.pub2/abstract>

Reference List for Length of Labor

Albers LL. The duration of labor in healthy women. *Journal of Perinatology*. 1999;19(2):114-119. <http://www.ncbi.nlm.nih.gov/pubmed/10642971>

Albers LL, Schiff M, Gorwoda JG. The length of active labor in normal pregnancies. *Obstet Gynecol*. 1996;87:355-359. <http://www.ncbi.nlm.nih.gov/pubmed/8598954>

American Congress of Obstetricians and Gynecologists (ACOG). Safe prevention of the primary cesarean delivery. *Obstetric Care Consensus*. 2014;1. <http://www.acog.org/Resources-And-Publications/Obstetric-Care-Consensus-Series/Safe-Prevention-of-the-Primary-Cesarean-Delivery>

Allen VM et al. Maternal and perinatal outcomes with increasing duration of the second stage of labor. *Obstet Gynecol*. 2009;113(6):1248-1258. <http://www.ncbi.nlm.nih.gov/pubmed/19461419>

Altman MR, Lydon-Rochelle MT. Prolonged second stage of labor and risk of adverse maternal and perinatal outcomes: a systematic review. *Birth*. 2006;33(4):315-322. <http://www.ncbi.nlm.nih.gov/pubmed/17150071>

Boyle A et al. Primary cesarean delivery in the United States. *Obstet Gynecol*. 2013;122(1):33-40. <http://www.ncbi.nlm.nih.gov/pubmed/23743454>

Cheng YW et al. Duration of the second stage of labor in multiparous women: maternal and neonatal outcomes. *Am J Obstet Gynecol*. 2007;196(6):585. <http://www.ncbi.nlm.nih.gov/pubmed/17547906>

Cheng YW et al. Length of the first stage of labor and associated perinatal outcomes in nulliparous women. *Obstet Gynecol*. 2010;116(5):1127-1135. <http://www.ncbi.nlm.nih.gov/pubmed/20966698>

Dekker R. Friedman's curve and failure to progress: a leading cause of unplanned C-sections. Evidence Based Birth review. 2013. <http://evidencebasedbirth.com/friedmans-curve-and-failure-to-progress-a-leading-cause-of-unplanned-c-sections/>

Friedman EA, editor. Labor: clinical evaluation and management, 2nd edition. New York: Appleton-Century-Crofts. 1978.

Reference List for Length of Labor

- Friedman EA. Primigravid labor; a graphicostatistical analysis. *Obstet Gynecol.* 1955;6(6):567-589.
- Friedman E. The graphic analysis of labor. *Am J Obstet Gynecol.* 1954;68(6):1568-1575.
- Jones M, Larson E. Length of normal labor in women of Hispanic origin. *J Midwifery Womens Health.* 2003;48(1):2-9.
<http://www.ncbi.nlm.nih.gov/pubmed/12589300>
- Kilpatrick SJ, Laros RKJ. Characteristics of normal labor. *Obstet Gynecol.* 1989;74(1):85-87.
- Klasko SK et al. The impact of mandated in-hospital coverage on primary cesarean delivery rates in a large nonuniversity teaching hospital. *Am J Obstet Gynecol.* 1995;172(2 Pt. 1):637-642.
<http://www.ncbi.nlm.nih.gov/pubmed/7856698>
- Kominiarek MA et al. Contemporary Labor Patterns: The Impact of Maternal Body Mass Index. *Am J Obstet Gynecol.* 2011;205(3):244.e1-244.e8. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3212654/>
- Kozhimannil KB, Law MR, Virnig BA. Cesarean delivery rates vary tenfold among US hospitals; reducing variation may address quality and cost issues. *Health Aff.* 2013;32:527-535.
- Laughon SK et al. Changes in labor patterns over 50 years. *Am J Obstet Gynecol.* 2012a;206(5):419.e1-419.e9.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3655692/>
- Laughon SK et al. Induction of labor in a contemporary obstetric cohort. *Am J Obstet Gynecol.* 2012b;206(6):486.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3361637/>
- Lee KA. Sleep in late pregnancy predicts length of labor and type of delivery. *Am J Obstet Gynecol.* 2004;191(6):2041-2046. <http://www.sciencedirect.com/science/article/pii/S0002937804005745>
- Neal JL et al. Outcomes of nulliparous women with spontaneous labor onset admitted to hospitals in pre-active versus active labor. *J Midwifery Womens Health.* 2014;59(1):28-34.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4104945/>

Reference List for Length of Labor

Neal JL et al. 'Active labor' duration and dilation rates among low-risk, nulliparous women with spontaneous labor onset: a systematic review. *J Midwifery Womens Health*. 2010a;55(4):308-318.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2904982/>

Neal JL et al. What is the slowest-yet-normal cervical dilation rate among nulliparous women with spontaneous labor onset? *J Obstet Gynecol Neonatal Nurs*. 2010b;39(4):361-369.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2928658/>

Neuhoff D, Burke MS, Porreco RP. Cesarean birth for failed progress in labor. *Obstet Gynecol*. 1989;73(6):915-920.

<http://www.ncbi.nlm.nih.gov/pubmed/2726112>

Norman SM et al. The effects of obesity on the first stage of labor. *Obstet Gynecol*. 2012;120(1):130-135.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4494673/>

Perl FM, Hunter DJ. What cervical dilatation rate during active labour should be considered abnormal? *Eur J Obstet Gynecol Repro Biol*. 1992;45(2):89-92. <http://www.ncbi.nlm.nih.gov/pubmed/1499852>

Rouse JL et al. Criteria for failed labor induction: prospective evaluation of a standardized protocol. *Obstet Gynecol*. 2000;96(5 Pt. 1):671-677. <http://www.ncbi.nlm.nih.gov/pubmed/11042299>

Rouse DJ et al. Eunice Kennedy Shriver National Institute of Child and National Human Development Maternal-Fetal Medicine Units. Failed labor induction: toward an objective diagnosis. *Obstet Gynecol*. 2011;117(2 Pt. 1):267-272.

<http://www.ncbi.nlm.nih.gov/pubmed/21252738.1>

Scotland GS et al. Women's preferences for aspects of labor management: results from a discrete choice experiment. *Birth*. 2011;38(1):36-46. <http://www.ncbi.nlm.nih.gov/pubmed/21332773>

Sheiner E et al. Risk factors and outcome of failure to progress during the first stage of labor: a population-based study. *Acta Obstet Gynecol Scand*. 2002.;81(3):222-226. <http://www.ncbi.nlm.nih.gov/pubmed/11966478>

Simon CE, Grobman WA. When has an induction failed? *Obstet Gynecol*. 2005;105(4):705-709.

<http://www.ncbi.nlm.nih.gov/pubmed/15802394>

Reference List for Length of Labor

Spetz J, Smith MW, Ennis SF. Physician incentives and the timing of cesarean sections: evidence from California. *Med Care*. 2001;39(6):536-550. <http://www.ncbi.nlm.nih.gov/pubmed/11404639>

Spong CY et al. Preventing the first cesarean delivery: Summary of a Joint Eunice Kennedy Shriver National Institute of Child Health and Human Development, Society for Maternal-Fetal Medicine, and American College of Obstetricians and Gynecologists Workshop. *Obstet Gynecol*. 2012;120(5):1181-1193. <http://www.ncbi.nlm.nih.gov/pubmed/23090537>

Zhang J et al. and the Consortium on Safe Labor. Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstet Gynecol*. 2010a;116(6):1281-1287. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3660040/>

Zhang J et al. Contemporary cesarean delivery practice in the United States. *Am J Obstet Gynecol*. 2010b;203(4):326. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2947574/>

Zhang J et al. The natural history of the normal first stage of labor. *Obstet Gynecol*. 2010c;115(4):705-710. http://journals.lww.com/greenjournal/Abstract/2010/04000/The_Natural_History_of_the_Normal_First_Stage_of.6.aspx

Zhang J, Troendle JF, Yancey MK. Reassessing the labor curve in nulliparous women. *Am J Obstet Gynecol*. 2002;187(4):824-828. <http://www.sciencedirect.com/science/article/pii/S000293780200248X>

Reference List for Birthing Positions

Adachi K, Shimada M, Usui A. The relationship between the parturient's positions and perceptions of labor pain intensity. *Nursing Research*. 2003;52(1):47-51. <http://www.ncbi.nlm.nih.gov/pubmed/12552175>

Adams SS, Eberhard-Gran M, Eskild A. Fear of childbirth and duration of labour: a study of 2206 women with intended vaginal delivery. *British Journal of Obstetrics and Gynaecology*. 2012;119(10):1238–1246. <http://www.ncbi.nlm.nih.gov/pubmed/22734617>

American College of Nurse-Midwives, Midwives Alliance of North America, National Association of Certified Professional Midwives. Supporting healthy and normal physiologic childbirth: a consensus statement by the American College of Nurse-Midwives, Midwives Alliance of North America, and the National Association of Certified Professional Midwives. *J Midwifery Womens Health*. 2012;57(5):529-532. <http://www.ncbi.nlm.nih.gov/pubmed/22954092>

Carroli G, Mignini L. Episiotomy for vaginal birth. Cochrane Collaboration review:CD000081. 2009. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000081.pub2/abstract>

De Jong PR et al. Randomised trial comparing the upright and supine positions for the second stage of labour. *British J Obstet Gynaecol*. 1997;104:567-571. <http://onlinelibrary.wiley.com/doi/10.1111/j.1471-0528.1997.tb11534.x/epdf>

De Jonge A et al. Increased blood loss in upright birthing positions originates from perineal damage. *BJOG*. 2007;114(3):349-355. <http://www.ncbi.nlm.nih.gov/pubmed/17217358>

De Jonge A, Teunissen TAM, Lagro-Janssen ALM. Supine position compared to other positions during the second stage of labor: a meta-analytic review. *Journal of Psychosomatic Obstetrics & Gynecology*. 2004;25(1):35-45. <http://www.tandfonline.com/doi/abs/10.1080/01674820410001737423>

Declercq ER. Listening to mothers III: pregnancy and birth. New York: Childbirth Connection. 2013. http://transform.childbirthconnection.org/wp-content/uploads/2013/06/LTM-III_Pregnancy-and-Birth.pdf

Dekker R. What is the evidence for pushing positions? Evidence Based Birth review. 2012. <http://evidencebasedbirth.com/what-is-the-evidence-for-pushing-positions/>

Reference List for Birthing Positions

Gardosi J, Hutson N, Lynch CB. Randomised, controlled trial of squatting in the second stage of labour. *The Lancet*. 1989;334(8654):74-77. <http://www.sciencedirect.com/science/article/pii/S0140673689903152>

Golara M et al. Upright versus recumbent position in the second stage of labour in women with combined spinal-epidural analgesia. *Int J Obstet Anesth*. 2002;11(1):19-22. <http://www.ncbi.nlm.nih.gov/pubmed/15321573>

Golay J, Vedam S, Sorger L. The squatting position for the second stage of labor: effects on labor and on maternal and fetal well-being. *Birth*. 1993;20(2):73-78. <http://onlinelibrary.wiley.com/doi/10.1111/j.1523-536X.1993.tb00420.x/abstract>

Green JM, Coupland VA, Kitzinger JV. Expectations, experiences, and psychological outcomes of childbirth: a prospective study of 825 women. *Birth*. 1990;17:15-24. <http://www.ncbi.nlm.nih.gov/pubmed/2346576>

Gupta JK et al. Position in the second stage of labour for women without epidural anaesthesia. Cochrane Collaboration review:CD002006. 2012. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD002006.pub3/abstract>

Hollins-Martin C J, Martin C. A narrative review of maternal physical activity during labour and its effects upon length of first stage. *Complementary Therapies in Clinical Practice*. 2013;19:44-49. <http://www.ncbi.nlm.nih.gov/pubmed/23337564>

Karraz MA. Ambulatory epidural anesthesia and the duration of labor. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*. 2003;80(2):117-122. <http://europepmc.org/abstract/med/12566183>

Kemp E et al. Position in the second stage of labour for women with epidural anaesthesia. Cochrane Collaboration review:CD008070. 2013. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008070.pub2/abstract>

Kilpatrick S, Garrison E. Normal labor and delivery. *Obstetrics: normal and problem pregnancies*. 2012. S.G. Gabbe. Philadelphia, PA: Saunders Elsevier:267-281.

Laughon SK et al. Induction of labor in a contemporary obstetric cohort. *AJOG*. 2012;206:486e481-489.

Reference List for Birthing Positions

Lawrence A et al. Maternal positions and mobility during first stage labour. Cochrane Collaboration review:CD003934. 2013;8. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003934.pub4/abstract>

Miquelutti MA, Cecatti JG, Makuch MY. Upright position during the first stage of labor: a randomized controlled trial. *Acta Obstetrica et Gynecologica Scandinavica*. 2010;86:553-558. <http://onlinelibrary.wiley.com/doi/10.1080/00016340601185251/abstract>

Molina FJ et al. Pain in the first stage of labor: relationship with the patient's position. *Journal of Pain and Symptom Management*. 1997;13(2):98-103. <http://www.sciencedirect.com/science/article/pii/S0885392496002709>

Nieuwenhuijze M et al. The role of maternity care providers in promoting shared decision-making regarding birthing positions during second stage labor. *J Midwifery Womens Health*. 2014;59(3):277-285. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4064714/>

Nieuwenhuijze M et al. Influence on birthing positions affects women's sense of control in second stage of labour. *Midwifery*. 2013;29(11):e107-114. <http://www.ncbi.nlm.nih.gov/pubmed/23415350>

Ondeck M. Healthy birth practice #2: walk, move around, and change positions throughout labor. *J Perinat Educ*. 2014;23(4):188-193. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4235058/>

Priddis H, Dahlen H, Schmied V. What are the facilitators, inhibitors, and implications of birth positioning? A review of the literature. *Women Birth*. 2012;25(3):100-106. <http://www.ncbi.nlm.nih.gov/pubmed/21664208>

Rice Simpson K. When and how to push: providing the most current information about second-stage labor to women during childbirth education. *J Perinat Educ*. 2006;15(4):6-9. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1804305/>

Romano AM, Lothian JA. Promoting, protecting, and supporting normal birth: a look at the evidence. *J Obstet Gynecol Neonatal Nurs*. 2008;37(1):94-104. <http://www.ncbi.nlm.nih.gov/pubmed/18226163>

Scotland GS et al. Women's preferences for aspects of labor management: results from a discrete choice experiment. *Birth*. 2011;38(1):36-46. <http://www.ncbi.nlm.nih.gov/pubmed/21332773>

Reference List for Birthing Positions

Simkin P, Ancheta R. The labor progress handbook: early interventions to prevent and treat dystocia, 3rd edition. New York: Wiley-Blackwell. 2011.

Sousa JP et al. Maternal position during the first stage of labor: a systematic review. *Reprod Health*. 2006;3:10. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1687181/>

Storton S. The coalition for improving maternity services: evidence basis of mother-friendly care. Step 4: providing the birthing woman with freedom of movement to walk, move, and assume positions of her choice. *J Perinatal Educ*. 2007;16(Supp.1):25S-27S. <http://www.ncbi.nlm.nih.gov/pubmed/18523670>

Reference List for Skin-to-Skin

- Azad MB et al. Gut microbiota of healthy Canadian infants: profiles by mode of delivery and infant diet at 4 months. *CMAJ*. 2013;185:385. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3602254/>
- Bystrova K et al. Early contact versus separation: effects on mother-infant interaction one year later. *Birth*. 2009;36(2):97-109. <http://www.ncbi.nlm.nih.gov/pubmed/19489802>
- Centers for Disease Control and Prevention (CDC). Maternity practices in infant nutrition and care (mPINC) survey. 2009. <http://www.cdc.gov/breastfeeding/data/mpinc/index.htm>
- Conde-Agudelo A and Diaz-Rossello JL. Kangaroo mother care to reduce morbidity and mortality in low birthweight infants. Cochrane Collaboration review:CD002771. 2014. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD002771.pub3/abstract>
- Crenshaw J et al. Use of a video-ethnographic intervention (PRECESS Immersion Method) to improve skin-to-skin care and breastfeeding rates. *Breastfeed Med*. 2012;7(2):69-78.
- Dekker R. The evidence for skin-to-skin care after a cesarean. Evidence Based Birth review. 2012. <http://evidencebasedbirth.com/the-evidence-for-skin-to-skin-care-after-a-cesarean/>
- Dekker R. Can hospitals keep mothers and babies together after a cesarean? Evidence Based Birth review. 2013. <http://evidencebasedbirth.com/can-hospitals-keep-moms-and-babies-together-after-a-cesarean/>
- Elverson CA et al. Social regulation of the stress response in the transitional newborn: a pilot study. *J Pediatr Nurs*. 2012;27(3):214-224. <http://www.ncbi.nlm.nih.gov/pubmed/22525809>
- Erlandsson K et al. Skin-to-skin care with the father after cesarean birth and its effect on newborn crying and prefeeding behavior. *Birth*. 2007;34(2):105-114.

Reference List for Skin-to-Skin

Harman T, Wakeford A. MICROBIRTH: Revealing the microscopic events during childbirth that could hold the key to the future of humanity. DVD. Alto Films: 2014.

Haxton D et al. Implementing skin-to-skin contact at birth using the Iowa model: applying evidence to practice. *Nurs Womens Health*. 2012;16(3):220-229. <http://www.ncbi.nlm.nih.gov/pubmed/22697225>

Hung KJ, Berg O. Early skin-to-skin after cesarean to improve breastfeeding. *MCN. The American journal of maternal child nursing*. 2011;36(5):318-324.

Hyde MF, Modi N. The long-term effects of birth by caesarean section: the case for a randomized controlled trial. *Early Hum Dev*. 2012;88:942-949.

Johnston C et al. Skin-to-skin care for procedural pain in neonates. Cochrane Collaboration review:CD008435. 2014. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008435.pub2/abstract>

McCall EM et al. Interventions to prevent hypothermia at birth in preterm and/or low birthweight infants. Cochrane Collaboration review:CD004210. 2010. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD004210.pub4/abstract>

Mahlmeister LR. Couplet care after cesarean delivery: creating a safe environment for mother and baby. *J Perinat Neonatal Nurs*. 2005;19(3):212-214.

Moore ER et al. Early skin-to-skin contact for mothers and their healthy newborn infants. Cochrane Collaboration review:CD003519. 2012. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003519.pub3/abstract>

Nolan A, Lawrence C. A pilot study of a nursing intervention protocol to minimize maternal-infant separation after cesarean birth. *J Obstet Gynecol Neonatal Nurs*. 2009;38(4):430-442.

Reference List for Skin-to-Skin

Pillai Riddell RR et al. Non-pharmacological management of infant and young child procedural pain. Cochrane Collaboration review:CD006275. 2011.

<http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD006275.pub2/abstract>

Ray JG et al. Maternal and neonatal separation and mortality associated with concurrent admissions to intensive care units. *CMAJ*. 2012;184(18):e956-962. <http://www.ncbi.nlm.nih.gov/pubmed/23091180>

Schulfer A, Blaser MJ. Risks of antibiotic exposures early in life on the developing microbiome. *PLoS Pathog*. 2015;11(7):e1004903. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4489621>

Smith J et al. The natural caesarean: a woman-centred technique. *BJOG: an international journal of obstetrics and gynaecology*. 2008;115(8):1037-1042.

Velandia M et al. Sex differences in newborn interaction with mother or father during skin-to-skin contact after caesarean section. *Acta Paediatr*. 2012;101(4):360-367.

Wildner K. Kangaroo Care. *Midwifery Today*. 2012;101.

<http://www.midwiferytoday.com/articles/kangaroocare2012.asp>

World Health Organization (WHO). Kangaroo mother care: a practical guide. Geneva: World Health Organization, Department of Reproductive Health and Research. 2003.

Reference List for Cord Clamping

Al-Tawil MM, Abdel-Aal MR, Kaddah MA. A randomized controlled trial on delayed cord clamping and iron status at 3-5 months in term neonates held at the level of maternal pelvis. *J of Neonatal-Perinatal Medicine*. 2012;5(4). <http://www.jnpm.org/content/randomized-controlled-trial-delayed-cord-clamping-and-iron-status-3%E2%80%935-months-term-neonates-0>

Andersson O et al. Effect of delayed versus early umbilical cord clamping on neonatal outcomes and iron status at 4 months: a randomized controlled trial. *British Medical Journal*. 2011;343:7157.

Andersson O et al. Effects of delayed compared with early umbilical cord clamping on maternal postpartum hemorrhage and cord blood gas sampling: a randomized trial. *Acta Obstetrica et Gynecologica Scandinavica*. 2012.

Carter RC et al. Iron deficiency anemia and cognitive function in infancy. *Pediatrics*. 2010;126(2):e427-434.

Ceriani CJM et al. The effect of timing of cord clamping on neonatal venous hematocrit values and clinical outcome at term: a randomized, controlled trial. *Pediatrics*. 2006;117(4):e779-786.

Ceriani CJM et al. The effect of early and delayed umbilical cord clamping on ferritin levels in term infants at six months of life: a randomized, control trial. *Arch Argent Pediatr*. 2010;108:201-208.

Chaparro CM. Timing of umbilical cord clamping: effect on iron endowment of the newborn and later iron status. *Nutrition Reviews*. 2011;69(Suppl 1):S30-S36.

Díaz-Castro J et al. The timing of cord clamping and oxidative stress in term newborns. *Pediatrics*. 2014. <http://pediatrics.aappublications.org/content/early/2014/07/09/peds.2013-3798.abstract>

Fogelson N. Delayed cord clamping should be standard practice in obstetrics. *Academic OB/GYN*. December 3, 2009. <http://academicobgyn.com/2009/12/03/delayed-cord-clamping-should-be-standard-practice-in-obstetrics/>. Accessed online 10/03/15.

Reference List for Cord Clamping

- Fogelson N. An update on delayed cord clamping, and thoughts on Internet expertise. *Academic OB/GYN*. December 14, 2011. <http://academicobgyn.com/2011/12/14/an-update-on-delayed-cord-clamping-and-thoughts-on-internet-expertise/#more-1139>. Accessed online 10/03/15.
- Hutton EK, Hassan ES. Late vs early clamping of the umbilical cord in full-term neonates: systematic review and meta-analysis of controlled trials. *JAMA*. 2007;297(11):1241-1252.
- Kinmond S et al. Umbilical cord clamping and preterm infants: a randomized trial. *British Medical Journal*. 1993;306:172-175.
- McDonald S et al. Effect of timing of umbilical cord clamping of term infants on maternal and neonatal outcomes. Cochrane Collaboration review:CD004074. 2013. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD004074.pub3/abstract>
- Mercer JS, Skovgaard R. Neonatal transitional physiology: a new paradigm. *J Perinat Neonat Nursing*. 2002;15(4):56-75.
- Mercer JS, Erickson-Owens DA. Rethinking placental transfusion and cord clamping issues. *J of Perinatal and Neonatal Nursing*. 2012;26(3):202-217.
- Mercer JS et al. Delayed cord clamping in very preterm infants reduces the incidence of intraventricular hemorrhage and late-onset sepsis: a randomized, controlled trial. *Pediatrics*. 2006;117(4):1235-1242. <http://pediatrics.aappublications.org/content/117/4/1235.short>
- Mercer JS et al. Seven-month developmental outcomes of very low-birth-weight infants enrolled in a randomized controlled trial of delayed versus immediate cord clamping. *J Perinatol*. 2010;30:11-16.
- Morley GM. How the cord clamp injures your baby's brain. February 21, 2002. <http://www.whale.to/a/morley1.html>. Accessed online 09/03/15.

Reference List for Cord Clamping

National Institute for Health and Care Excellence (NICE). Intrapartum care: care of healthy women and their babies during childbirth (CG190), Guidance 1.14.14. December 2014. <http://www.nice.org.uk/guidance/cg190/chapter/1-recommendations#care-of-the-newborn-baby>

Rabe H et al. A randomized controlled trial of delayed cord-clamping in very low-birth-weight preterm infants. *Eur J Pediatr.* 2000;159:775-777.

Rabe H et al. Early cord clamping versus delayed cord clamping or cord milking for preterm babies. Cochrane Collaboration review:CD003248. 2012. <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD003248.pub3/abstract>

Sloan M. Common objections to delayed cord clamping—what's the evidence say? *Science & Sensibility.* November 13, 2012. <http://www.scienceandsensibility.org/common-objections-to-delayed-cord-clamping-whats-the-evidence/>. Accessed online 07/14/15.

Sloan M. New Cochrane review: delayed cord clamping likely beneficial for healthy term newborns. *Science & Sensibility.* July 25, 2013. <http://www.scienceandsensibility.org/?s=delayed+cord+clamping>. Accessed online 10/03/15.

World Health Organization (WHO), Department of Making Pregnancy Safer. WHO recommendations for the prevention of postpartum haemorrhage. Geneva: World Health Organization. 2007.

World Health Organization (WHO). Optimal timing of cord clamping for the prevention of iron deficiency anaemia in infants. e-Library of Evidence for Nutrition Actions (eLENA). 2015:10(19). http://www.who.int/elena/titles/cord_clamping/en/. Accessed online 10/03/15.

Yao AC, Lind J. Effect of gravity on placental transfusion. *Lancet.* 1969;2:505-508.

Reference List for Breastfeeding (and The Microbiome)

Berzirtzoglou E, Tsiotslas A, Weilling GW. Microbiota profile in feces of breast- and formula-fed newborns by using fluorescence in situ hybridization (FISH). *Anaerobe*. 2011;17(6):478.

Black RE, Victora CG, Walker SP, and the Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*. 2013;published online. <http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2813%2960937-X/fulltext>. Accessed online 10/04/15.

Cabrera-Rubio R et al. The human milk microbiome changes over lactation and is shaped by maternal weight and mode of delivery. *Am J Clin Nutr*. 2012;96:544-551.

Dewey KG. Diet, child nutrition and the microbiome. Presentation to the human microbiome science: vision for the future, Bethesda, MD, July 24 to 26, 2013. https://www.genome.gov/Multimedia/Slides/HumanMicrobiomeScience2013/28_Dewey.pdf. Accessed online 10/04/15.

Groer MW et al. Development of the preterm infant gut microbiome: a research priority. *Microbiome*. 2014;2:38.

Guaraldi F, Salvatori G. Effect of breast and formula feeding on gut microbiota shaping in newborns. *Front Cell Infect Microbiol*. 2012;2:94.

Horta BL, Bahl R, Martinés JC, Victora CG. Evidence on the long-term effects of breastfeeding: systematic reviews and meta-analysis. Geneva: World Health Organization. 2007. http://www.who.int/maternal_child_adolescent/documents/9241595230/en/. Accessed online 10/03/15.

La Leche League International (LLL). Benefits of breastfeeding. <http://www.llli.org/nb/nbbenefits.html>. Accessed online 10/04/15.

Reference List for Breastfeeding (and The Microbiome)

Mackie RI et al. Developmental microbial ecology of the neonatal gastrointestinal tract. *Am J Clin Nutr*. 1999;69:1035S-1045S.

Mueller NT et al. The infant microbiome development: mom matters. *Trends Mol Med*. 2015;21(2):109-117. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4464665>

Praveen P, Jordan F, Primai C, Morine MJ. The role of breast-feeding in infant immune system: a systems perspective on the intestinal microbiome. *Microbiome*. 2015;3:41. <http://www.microbiomejournal.com/content/3/1/41>

Song SJ, Dominguez-Bello MG, Knight R. How delivery mode and feeding can shape the bacterial community in the infant gut. *CMAJ*. 2013;185(5):373-374. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3602250>

Stuebe A. The risks of not breastfeeding for mothers and infants. *Rev Obstet Gynecol*. 2009;2:222-231.

Thompson AL et al. Milk- and solid-feeding practices and daycare attendance are associated with differences in bacterial diversity, predominant communities, and metabolic and immune function of the infant gut microbiome. *Front Cell Infect Microbiol*. 2015;5(3). <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4318912>

WebMD. Breastfeeding overview. <http://www.webmd.com/parenting/baby/nursing-basics>. Accessed online 10/04/15.

World Health Organization (WHO). 10 Facts on breastfeeding. <http://www.who.int/features/factfiles/breastfeeding/facts/en/>. Accessed online 10/04/15.

World Health Organization (WHO). Short-term effects of breastfeeding: a systematic review on the benefits of breastfeeding on diarrhea and pneumonia mortality. Geneva: World Health Organization. 2013. http://www.who.int/maternal_child_adolescent/documents/breastfeeding_short_term_effects/en/. Accessed online 10/03/15.